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What are the critical features of successful Tier 2 lifestyle weight management programmes for children aged 0-11 years? A systematic review to identify the programme characteristics, and combinations of characteristics, that are associated with successful outcomes

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Glossary

BMIz – Since children’s Body Mass Index (BMI) varies with age a growth reference is used, i.e. BMI is compared to typical values for other children of the same age.

Children - Children aged 0-11 years inclusive.

Condition - A characteristic or feature of a weight management programme.

Configuration - A specific combination of conditions or features of a weight management programme.

Domain - A group of weight management programme conditions or characteristics which cluster around a broader theme such as goal setting.

Least effective interventions – WMP interventions showing a mean difference in BMIz between intervention and control at 12 months of -0.05 or less.

Model - A theoretically driven configuration of conditions.

Most effective interventions - WMP interventions showing a mean difference in BMIz between intervention and control at 12 months of at least -0.25 (the minimum reduction that has been associated with clinically significant health improvements).

Service users - Children with overweight or obesity and their parents/carers who have experience of weight management programmes for children. This includes families who have been referred to, but declined to engage in, weight management programmes for children.

Service providers - Those with experience of delivering weight management programmes to children aged 0-11 years.

Weight management programme (WMP) - Weight management services, provided in the public, private or voluntary sector, which are multi-component, i.e. they address both diet and exercise. In the UK these usually fit within the provision type known as 'Tier 2 services'.

Executive summary: Overview of this report

Aim

This report is of a systematic review commissioned by Public Health England which aims to address the following question:-

'What are the critical features of successful Tier 2 weight management programmes (WMPs) for children aged 0-11 years?'

Methods

The review is comprised of three interconnecting pieces of work:-

- 1. An analysis of UK children's, parents and providers' views** from 11 studies to understand which WMP *features* are perceived as key to successful weight management and the *mechanisms* through which these features are perceived to lead to successful weight management.
- 2. Analysis of 30 WMP evaluations** to test whether features *perceived* to be important are actually *associated with improved weight management*. 20 evaluations of WMP interventions were included in a qualitative comparative analysis (QCA); we compared the features of the 5 'most effective' interventions (i.e. those achieving clinically significant improvements in BMIz) with the features of the 15 'least effective interventions'¹.
- 3. Case studies with two Local Authorities** to ensure the findings of the review could be put to best use.

¹ We ranked the 30 evaluations in terms of the size of the mean difference in BMIz seen between the trial's intervention and control arms at 12 months and selected the most and least effective for analysis. We defined 'most effective' interventions as those showing a mean difference in BMIz between intervention and control at 12 months of at least -0.25 (the minimum reduction that has been associated with health improvements in adolescents; there remains a lack of evidence for younger children). We defined 'least effective' interventions as those showing a mean difference in BMIz between intervention and control at 12 months of -0.05 or less. Henceforth, these will be referred to as 'most effective' and 'least effective' trials.

Findings

Analysis of children’s, parents and providers views revealed that **three key WMP features** were felt to support development of the skills, confidence and resilience perceived by participants to be necessary for successful weight management. The three features are 1) showing families **how to change** rather than telling them what to change 2) getting all the **family ‘on board’**, and 3) enabling **social support** from peers. Table 1 below provides an overview of these themes.

Table 1: Summary of findings on the views of children, parents and providers

Theme	Example view	Sub-themes
Learning how to change: Practical experiences that show you how to change rather than telling you what to change	<i>“It wasn’t just like ‘you need to do more exercise and you need to eat better’ – it actually taught us like how to” child (1) p181</i>	Practical experiences, as opposed to didactic information giving, were valued:- <ul style="list-style-type: none"> • Practical physical activity sessions were widely and emphatically praised for giving children confidence and enabling them to experience enjoyment of being active. • Practical and interactive healthy eating sessions were also highly valued such as cooking or tasting foods, and visual approaches, e.g. to illustrate portion size. • Practical health behaviour change strategies such as goals, monitoring or parenting skills, were also felt to be helpful.
Getting all the family ‘on-board’: Shared understanding and a healthy home environment	<i>“They’ve got to have the support of the others in the family otherwise it’s almost impossible” (2) p238</i>	One key impediment to change was felt to be other family members both within the home and in relation to extended family and friends. Engaging the wider family was felt to enable:- <ul style="list-style-type: none"> • shared understanding across family members • shared responsibility for making changes; • the creation of a healthy home environment.
Social support: a safe space with similar others in which to gain confidence and skills	<i>“finding out you weren’t alone in this [...] having an open forum to say my kid does that too, cause you feel so guilty” Parent (3) p177</i>	<ul style="list-style-type: none"> • Families were emphatic about group sessions which provided a positive contrast to experiences of prejudice and bullying. • In particular group sessions were described as having a positive impact on children’s confidence, which was described as fundamental to both initiation and maintenance of health behaviour changes. • Skilled providers helped to create positive group experiences

Analysis of service evaluations revealed that all five most effective interventions (i.e. those achieving clinically significant improvements in BMIz) were characterised by each of the three WMP features identified as important by service users and providers; by contrast each of the 15 least effective interventions were characterised by the absence of these features. Examples of the components within each feature are provided in Table 2 below.

1. **Showing families how to change** through practical sessions was found to be associated with higher effectiveness. All most effective interventions a) provided **physical activity sessions** for children and b) delivered more than two **practical behaviour change strategy** sessions. Whilst practical healthy eating components such as food tasting did not distinguish between most and least effective interventions all most effective interventions were characterised by the following healthy eating condition c) **advice on calorie** intake; absence of any one of these features was consistently associated with reduced effectiveness.
2. Efforts to ensure **all the family are on board** with the programme were also associated with increased effectiveness. All of the most effective interventions aimed to engage the whole family through a) delivering more than two **discussion/education sessions for both children and parents** and b) delivering **child-friendly** sessions. In addition, successful interventions were characterised by c) **aiming to change behaviours across the whole family** rather than just the participating child. The absence of any one of these features was consistently associated with least effective interventions.
3. WMPs which enabled **social support** for both parents and children by delivering group interventions were all most effective. Most effective interventions were characterised by the presence of both a) **group sessions specifically for children** and b) more than two **group sessions specifically for parents**. Absence of either of these conditions was consistently associated with least effective interventions.

Table 2: Examples of components within each of the three key features

Component	Example(s)
Feature: Showing families how to change	
Physical activity sessions for children	<i>Children were supervised on dancing to music and ball playing, aiming at developing motor skills and having fun during exercise. (Bocca et al. 2012 p.1110)</i>
Practical behaviour change strategies	<i>Parents learned to be a healthy role model and work with feasible goals and healthy rewards. They also learned how to use sticker charts to motivate the children and keep track of their progress ... practical ways to remove unhealthy food triggers. (Bocca et al. 2012 p.1110)</i>
Advice on calorie intake	<i>Calorie goals were set to gradually achieve an energy intake in the range of 1,000–1,200 per day depending on the child’s age (Stark 2011 p.135)</i>
Feature: Getting all the family ‘on-board’	
Discussion/education sessions for both children and parents	<i>A combination of a group clinic sessions and individual home visits that encourage learning via didactics, peer sharing, and in vivo practice of behavioral parenting skills (Stark 2011 p. 139)</i> <i>Each participant was encouraged to compile a log, which included the names of all the fruits and vegetables consumed each day, daily physical activity, and a parent’s signature, and to discuss the log weekly in the group. (Wiegel et al. 2008 p.372)</i>
Child friendly sessions (efforts to ensure sessions were appealing or accessible for children)	<ul style="list-style-type: none"> • Games and art activities (Stark et al. 2011 p. 135) • Children and adolescents were divided into 3 groups according to age—7-8 years, 9-10 years, and 11-13 years—at the beginning of the program, to facilitate appropriate training. (Wiegel et al. p.371)
Aiming to change whole family behaviours	<i>Aiming to promote an active, health-oriented lifestyle in children, adolescents, and their families (Wiegel et al. 2008 p.370)</i>
Feature: Social support	
Group sessions specifically for children	<i>Children were seen concurrently in a group format. They received nutrition education through games and art activities, tried new foods during a structured meal, and completed 15 min of moderate to vigorous activity. (Stark et al. 2011 p.135)</i>
Group sessions specifically for parents	<i>Behavioral therapy for parents comprised 6 group sessions of 120 minutes each that were guided by a psychologist. (Bocca et al. 2012 p.1110)</i>

Case studies with **Local Authority WMP commissioners and providers** revealed that their experiences resonated with the findings on two key mechanisms (showing families how to change, and getting all family members ‘on board’) but discussion with one authority revealed how delivery of group programmes may be a challenge for authorities in rural areas, such that creative approaches to enable social support may be needed.

Discussion

Our findings concur with the broad findings of previous reviews but offer a more nuanced understanding of how WMPs work to achieve successful weight management. The review complements existing evidence by providing fine-grained detail on key WMP characteristics and the underlying mechanisms associated with successful weight management in children.

Nevertheless, there were limitations of this analysis. These particularly related to the size and small number of service evaluations that were categorised as most effective; only five interventions were found to achieve clinically significant results and many of these studies involved small samples. However, our conclusions are strengthened by findings about the larger, and therefore more robust, set of least effective interventions since key combinations of characteristics were both *present* in most effective interventions and *absent* in least effective interventions. The nature of the most effective interventions also posed another limitation to our analysis in terms of generalisability, since four of the five most effective interventions were delivered to children aged under five whilst the least effective interventions and the views studies were largely conducted with those aged five and over. The evidence contained within the review did not enable us to explain if and/or why interventions delivered to this age-group may be more effective, the apparent association certainly warrants further research but it may be entirely spurious. Nevertheless, we do not consider this to be a significant impediment to the generalisability of the reviews findings since they are supported not only by this small group of four studies but by the body of the 31 included studies (11 views

studies and 20 service evaluations) and by each of the three strands of analysis (views, service evaluations and case studies).”

Implications for commissioners and providers:-

- The findings of this review provide further detail to support existing guidelines such as NICE PH47
- LWMPs should seek to develop families’ skills and confidence through the use of practical **programme components that show them how to change** including through a) group **physical activity sessions** or, where not feasible, other means of enabling experience of physical activity b) delivering **practical behaviour change strategies**, such as goal-setting and parenting skills and c) providing **calorie guidance** such that families have a broad understanding of the need to balance energy intake with energy expenditure.
- LWMPs should seek to **engage the whole family** in order to ensure shared understanding and encourage a healthy home environment. LWMPs should therefore seek to a) change the **health behaviours of the whole family**; b) ensure a **sufficient number of sessions** for both parents and children; and c) ensure the **programme is engaging for children**.
- LWMPs should include **group-based sessions**, or where group sessions are not feasible seek **other options** to ensure participants are able experience the **beneficial effects of peer support**.

Key implications for future research:

- Further studies are needed to:
 - Explore whether (and if so why) interventions delivered to children aged under five years are more likely to be effective than those delivered to older children
 - Identify by what mechanism provider-set energy goals may have an impact within LWMPs and what role, if any, negotiated goals should play
 - Assess how best to create peer support e.g. which group size or composition is ideal

- Incorporate process evaluations within trials to explore the implementation and experiences of the interventions being evaluated

Conclusion

The evidence contained within this report indicates that the three key mechanisms perceived by children, parents and providers to support health behaviour change were fostered by most effective interventions and were not fostered by least effective interventions. Thus future service provision should aim to ensure that the whole family is on board with the programme, that there are opportunities for parents and children to receive social support and that families are not just told what to change but *shown how* to change.

Table 3: Summary of overall findings

Critical feature	Example view	Most effective interventions (n=5)	Least effective interventions (n=15)
Showing families how to change	“It actually taught us, like, how to”	<p>All 5 most effective interventions: Had physical activity sessions for children AND Had more than two sessions on practical behaviour change strategies AND Provided advice on calorie intake</p>	<p>All 15 least effective interventions: HAD NO physical activity sessions for children OR HAD TWO OR FEWER sessions on practical behaviour change strategies OR DID NOT provide advice on calorie intake</p>
Getting all the family on board	“They’ve got to have the support of others in the family otherwise it’s almost impossible”	<p>All 5 most effective interventions: Were designed to be child friendly AND Aimed to change behaviour of the whole family AND Had more than two discussion/education sessions for children and for parents</p>	<p>All 15 least effective interventions: WERE NOT designed to be child friendly OR Aimed to change behaviour of ONLY the child OR HAD TWO OR FEWER discussion/education sessions for child and for parents</p>
Social support	“Finding out you weren’t alone in this”	<p>All 5 most effective interventions: Had sessions for groups of children AND Had more than two group sessions for parents</p>	<p>All 15 least effective interventions: HAD NO sessions for groups of children OR HAD TWO OR FEWER group sessions for parents</p>

1. Introduction

1.1 Why is this systematic review being done?

Obesity poses one of the greatest public health challenges for the 21st century (4). England, along with the rest of the UK, has one of the highest rates of obesity in the developed world; nearly one in five children aged 10-11 years in England are obese and among children aged 4-5 years the rate is one in ten (5).

Whilst in recent years the proportion of children classified as overweight or obese in England may seem to be stabilising, rates are still high and are markedly higher than they were two decades ago (5). In 2013 over one quarter of children between the ages of 2 and 10 years in England were overweight or obese (6).

Overweight and obesity are known to have harmful impacts. Obesity has a significant detrimental effect on individuals' life expectancy and is a leading cause of type 2 diabetes, heart disease and cancer (7). Poor mental health also affects many obese adults (8, 9) and many face multiple forms of prejudice and discrimination because of their weight (10). Whilst many of the health consequences of being obese are seen in adults, since children with obesity are more likely to continue being obese into adulthood (11), these are very real consequences for them too.

However, the negative impacts of childhood obesity are not merely the long-term consequences of disease in adulthood. Increasing numbers of children are being diagnosed with Type 2 diabetes (12) and higher BMI has been found to increase the risk of asthma in mid-childhood (13). Evidence also suggests that children who are overweight are targets of weight-related discrimination and bullying (10, 14).

1.2 Weight management in the UK - The policy context

In 2007 the UK government's cross department Foresight project was explicit in its strategic objectives; to explore the reasons for the rise in obesity and deliver a sustainable response in the UK over the coming 40 years (15). The findings of the

Foresight project informed the coalition government's strategy Healthy Lives, Healthy People: A Call to Action on Obesity in England published in 2011 (16) which set a target of a downward trend in excess weight for children and adults by 2020.

One key element of the current government's approach to tackling child obesity is the National Child Measurement Programme (NCMP). Since 2006 this nationally mandated public health programme has measured the height and weight of children aged 4–5 years (Reception) and 10–11 years (Year 6) in England on an annual basis (17).

The Health and Social Care Act of 2012, which created Public Health England (PHE) as an expert national public health body and executive agency of the Department of Health, also shifted responsibility for public health to local authorities (LAs). This responsibility means that, as part of their work to tackle obesity, LAs will need to plan and deliver lifestyle weight management programmes (LWMPs), also known as Tier 2 WMPs.

In the UK, we have robust and comprehensive high level guidance on “what works?” to promote weight management among children (i.e. NICE guidance). LWMPs provided in the public, private or voluntary sector which address both diet, physical activity and behaviour change, have been shown in many systematic reviews to be broadly effective, (18, 19). However, to aid commissioning decisions, more fine-grained evidence is needed. More information is also needed about the status of current provision within local authorities in the UK.

1.3 What research has been done before?

There has been extensive research effort in examining the impact of LWMPs for overweight and obese individuals. Large numbers of systematic reviews and even reviews of reviews (4, 20) have already been undertaken in relation to adults.

Addressing overweight and obesity in children is more complex for several reasons. First, in adults weight loss and a reduced BMI will be the target outcome, however

amongst children, since BMI varies with age and sex and as they are still growing, the desired outcomes will vary from person to person and might be either weight reduction or deceleration of weight gain (21). Second, since children have less control over their food and physical activity choices the target audience for behaviour change may be the child themselves but also the parents or carers of that child. Systematic reviews have demonstrated that maternal factors such as pre-pregnancy overweight and maternal smoking in pregnancy increase the likelihood of childhood obesity and overweight, whilst breastfeeding and the late introduction of solid foods is moderately protective against childhood overweight (22). In young children in particular parental feeding practices have been widely implicated in the development of weight gain and obesogenic eating behaviours (23, 24). As such, weight management programmes for children will need to take account of these complexities.

Nevertheless, since obesity prevalence in the UK doubles (from 9% to 19%) between the point at which children enter school at age 4-5 and the time they leave primary school at age 10-11 (17), LWMPs that target this age group may be particularly important for addressing overall rates of obesity, making it imperative that we understand how to address the needs of this age group, as well as pre-school children.

Systematic reviews have been undertaken which examine the effectiveness of lifestyle WMPs for children (18). In recent years, reviews of WMP effectiveness have included interventions developed for young children have produced findings specifically for South Asian populations (25), smartphone-based interventions (26), interventions set in general practice (27) and interventions that include school or family involvement (28).

Also recently, two comprehensive and UK relevant reviews conducted for NICE have addressed the effectiveness of WMPs specifically for children and adolescents (0-18 years) (29) and barriers and facilitators of implementing WMPs for this age group (30). With reference to children aged 0-11 years, a soon-to-be published series of

updates of a Cochrane review (31) will provide findings on the effectiveness of WMPs specifically for the early years age group (0-6 years), primary school aged children (7-12 years) (32) and interventions targeting parents only (19). Together these reviews constitute a very robust evidence base for understanding in broad terms whether WMPs for children are effective or not and for estimating the average size of the effect that WMPs can have on children.

However, WMPs are social interventions characterised by complexity; that is, they tend to have multiple interacting components and their effects can be moderated by many factors, including their context and the characteristics of the people targeted and those involved in service delivery. The WMPs that have been evaluated tend to vary in the components that they incorporate and the contexts of their delivery. As such, to aid commissioning and service decisions in England and to feed into the development of commissioning blueprints, the sound but high-level guidance described above needs to be complemented by more fine-grained evidence about the critical features of such interventions. This report presents preliminary findings from a mixed method evidence synthesis specifically designed to identify the critical features of lifestyle weight management interventions for early years and school aged children.

This review uses innovative methodological approaches to build on the existing evidence base, in particular upon the 2013 NICE review (29) and Cochrane reviews (19, 33). It draws on the views of users and providers of weight management services, taking these as a starting point to explore explanations for the varied effectiveness of different WMPs that have been evaluated.

1.4 What did this systematic review aim to find out?

The primary purpose of this review is to help commissioners identify what a good Tier 2 weight management service for children “looks like” and the different kinds of services that might fit particular situations. Thus, we employed analytical approaches to enable a finely detailed examination of the critical components of weight

management programmes. The review was guided by the following overarching question:-

'What are the critical features of successful Tier 2 weight management programmes for children aged 0-11 years?'

1.5 How was the systematic review conducted?

This section provides a brief overview of the methods used to conduct the review. A comprehensive account of the methods, as required for any systematic review, is provided in Section 6. The review comprises of three stages:

1. Views synthesis: we examined UK research reporting children's, parents' and providers' perspectives and experiences about receiving or delivering a WMP to understand what they feel are critical features for successful programmes.

2. Trials synthesis: we used the findings from the views synthesis to see if the identified components help to explain differences in outcomes between WMPs examined in recent systematic reviews. We examined the characteristics of those WMPs found to be most effective for improving BMIz (i.e. those achieving clinically significant improvements in BMIz) and those found to be least effective.

3. Case studies: we conducted case studies with two Local Authorities to explore the nature of current WMP provision and to consider the implications of the views and trials synthesis for future provision.

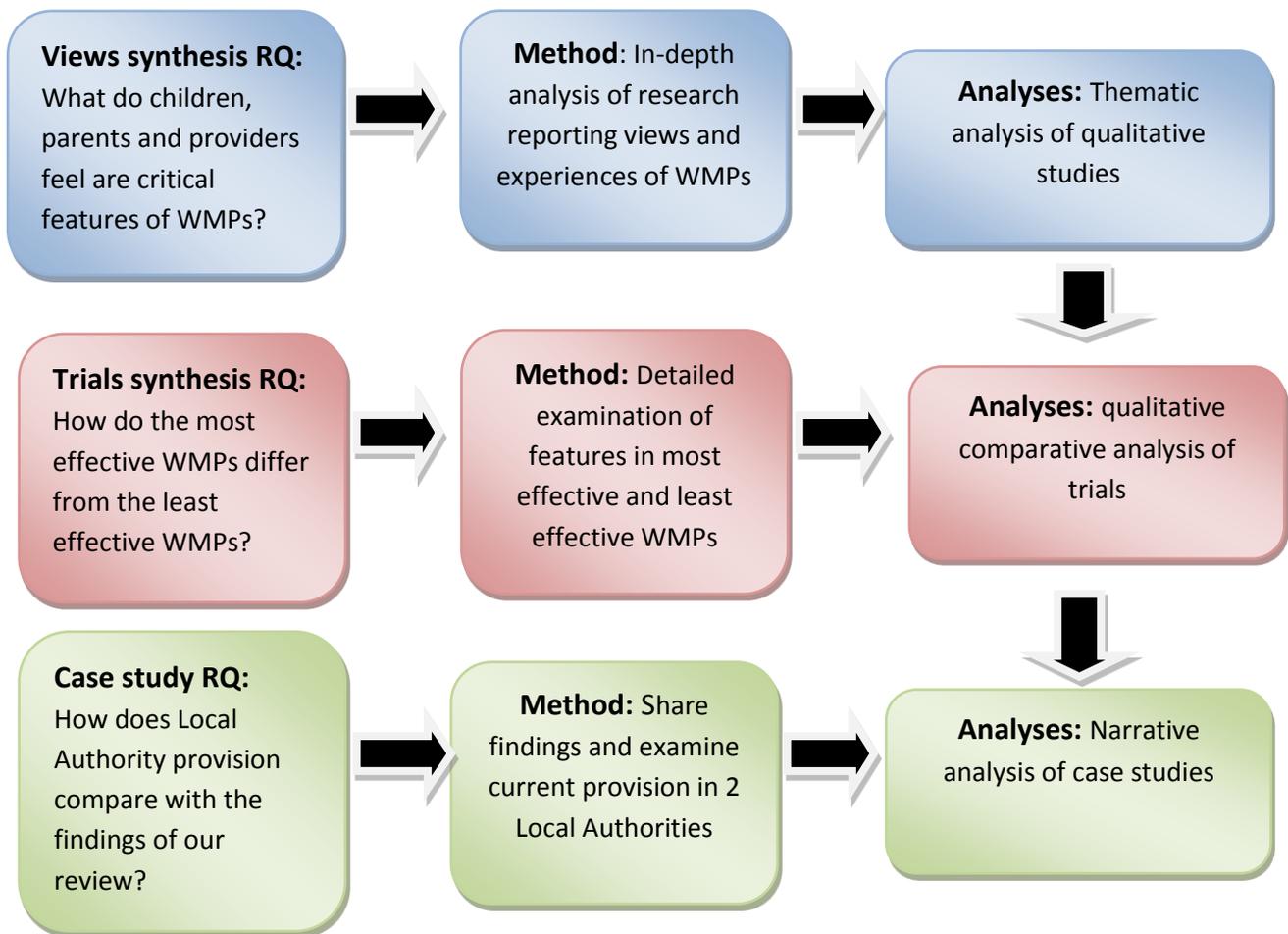
1.6 How is this review different from previous reviews?

The depth of analysis undertaken in the **views synthesis** aims to achieve a more comprehensive, systematic and detailed understanding of how child LWMPs work, according to those with experience of receiving or delivering them. In addition to identifying which programme components are valued we have aimed to systematically identify how specific elements are perceived to support healthy behaviour change.

The trials synthesis differs from previous syntheses of child LWMP trials in three key ways. First, the views of child and parent users of WMP and providers, as identified by the views synthesis have been used to examine associations between child WMP components and effectiveness. Second, the most effective WMP interventions have been compared with those that are least effective; by excluding those studies with moderate effects we aimed to remove the ‘noise’ which may obscure identification of components critical for higher effectiveness. Third, qualitative comparative analysis (QCA), rather than traditional statistical meta-analysis, has been employed to quantify observed associations between child WMP components and effectiveness. QCA seeks to identify the necessary and sufficient conditions for an outcome to be obtained. Unlike the statistical methods often employed in meta-analyses, QCA is appropriate for use in situations where the number of similar studies is small, where a large number of possible factors could explain variation in outcomes, and where potentially there are multiple pathways to success (34-36).

The case studies are designed to improve the utility and relevance of the final report, first by providing much needed insight into the nature of current provision in the UK; and second by exploring the implications of the findings from the views and trials syntheses for future commissioning.

Figure 1: Overview of review methods



2 Views synthesis: What do children, parents and providers feel are the critical features of LWMPs?

2.1 What evidence was examined for the views synthesis?

2.1.1 Summary of evidence included in the views synthesis

- We examined data from **11 qualitative studies** from the UK published between 2008 and 2014 (1-3, 37-44).
- Eight of the studies presented **views from children** (1, 2, 37, 38, 40, 41, 43, 44) (although four of these studies present only very limited perspectives from children (40, 41, 43, 44)), ten studies contain **parents' and carers' views** (hereafter referred to as 'parents') (1-3, 38-44) and four contain the views of **service providers** (2, 38, 41, 44).
- Nine studies were conducted in England, one was conducted in Scotland (42), and one study was unclear about where in the UK it was conducted (2).
- The studies sought views from a total of 197 children, 174+ parents and 55 providers, although it was not always clear how many actually contributed views, particularly within group interviews.
- The included studies represent a good range of participants in terms of:-
 - the gender of children: although findings were rarely reported by gender
 - the gender of parents and carers: mothers and female carers predominated but males were represented;
 - family socio-economic status: four studies focused on socioeconomically deprived communities; and
 - family ethnicity: many studies had mixed populations and three studies focused exclusively on BME populations.
- All studies focused on primary school aged children (aged between four and 11 years) but nine also focused on older children, although we used only those findings that were reported to be from children aged up to and including 11 years, or from parents or carers or providers of LWMPs for children of that age.
- Eight of the programmes discussed involved regular **group sessions** which included physical activity sessions; the remaining three offered **individual family**

consultations with health professionals and advice about or access to leisure facilities.

2.1.2 Overview of the 11 studies of children, parent and provider views

Qualitative studies were identified from existing reviews (14, 30, 45, 46) and a modified update of the search strategy used by the NICE review (30) (see appendix 4). We included qualitative studies from the UK reporting the views of children aged ≤ 11 years, parents of children aged ≤ 11 years or service providers on their experiences and views of a LWMP for children. Section 6 contains more detail about the methods used to identify studies for inclusion. Table 2.1.2 provides an overview of each of the 11 studies (1-3, 37-44), which were reported in 19 papers². A more comprehensive table with details of participant characteristics is provided in Appendix 1.

Whilst children were described as contributing to or being present during interviews in eight studies³, the findings within four of those studies focus entirely or mostly on parents'⁴ views (39-41, 43, 44); Thus, in the analysis there are eight sets of children's views of which four are limited in scope, 10 sets of parent views and four sets of provider views.

The LWMPs discussed in the 11 views studies varied. Most involved regular group sessions with physical activity but three involved individual family appointments (40, 42, 44). Two of these three did not provide physical activity sessions within the programme (42, 44). The programmes' duration varied widely, from seven weeks,

² For ease, a single publication will be referred to for each study in the text, unless quotations from related reports are being used.

³ Two studies reporting parent views were described as containing children's views but we were unable to use these. In the study by Newson et al. (38), no children's views were evident. In the study by Pittson (40), children's views were only collected in quantitative form and since we excluded other studies of this type we felt it was not appropriate to include this data.

⁴ We use the term 'parents' to denote a range of carers involved in the studies including grandparents, aunts and family friends.

with a follow-up session seven weeks later (43), to a year (39). Two programmes held sessions twice weekly (2, 38), six others were weekly and three were less frequent (40, 42, 44). Most of those that included group sessions held separate groups for parents and children as well as combined parent-child groups, either for all or some activities.

Table 2.1.2: Overview of included views studies

Ref no.	Study	Lifestyle weight management programmes			Type	Number of participants			Children's gender	Additional information
		Name	Provider	Target age		Children	Parents /carers	Providers	% female	
(37)	Lewis et al. (2014)	Un-named	community	6-16	Group-based	58	-	-	50%	39 children were aged 6-11 years, of which 19 were male
(38, 47)	Lucas et al. (2014)	"MEND"	community	7-13	Group-based	31	33	29	45%	22 children interviewed were attending the programme, 9 were siblings.
(39)	Newson et al. (2013)	Un-named	NHS	5-15	Group-based	-	14	-	Ns	
(40)	Owen et al. (2009)	Un-named	NHS	5-18	Individual family	11*	21	-	55%	2 children aged 5-10 years; 9 aged 11-18 years
(3)	Pittson (2013)	"Y W8?"	NHS	8-13	Group-based	-	6	-	-	Parents interviewed: 5 children were female; 2 male. Mean age of completers: 10.6 years
(41, 48)	Robertson (2009)	"Families for Health"	community	7-11	Group-based	18*	13	1	72%	Children's group interviews age range 7-13 years. Included two siblings with 'normal' BMI who attended the programme.
(2)	Staniford et al. (2011)	"MEND"	community	7-13	Group-based	10	7	9	70%	Participants involve those both pre-treatment and post-treatment

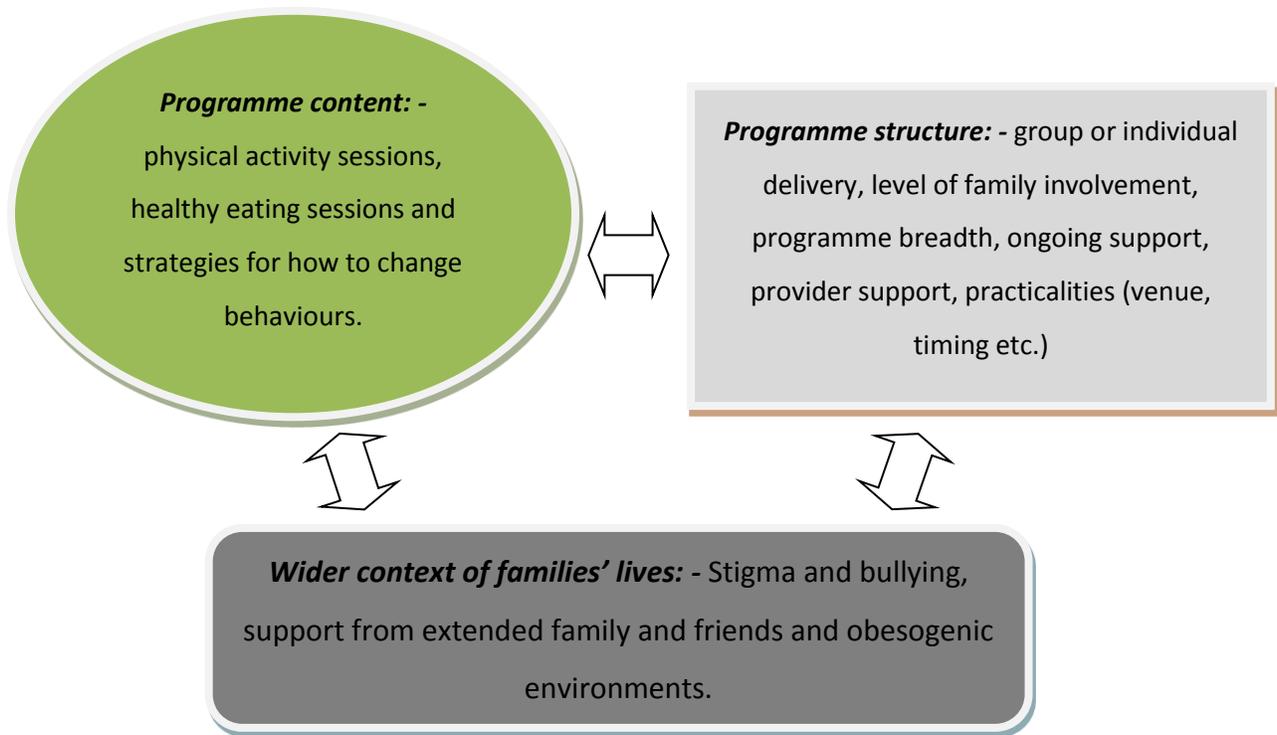
Ref no.	Study	Lifestyle weight management programmes				Number of participants			Children's gender	Additional information
		Name	Provider	Target age	Type	Children	Parents /carers	Providers	% female	
(42, 49, 50)	Stewart et al. (2008)	Un-named	NHS	5-11	Individual family	-	17	-	53%	8 parents received the programme; 9 were in the control arm. 8 were parents of 5-8 year olds; 9 were parents of 9-11 year olds
(43)	Trigwell et al. (2011)	"GOALS"	community	5-13	Group-based	13*	9	-	62%	Nine families with 13 children participating were involved in qualitative data collection.
(44)	Visram et al. (2013)	"Balance It!"	NHS	4-17	Individual family appointments	17*	20+**	16	45%	Five children were aged 8 years or younger, seven were 9-12 years old, eight were 13+ years old
(1, 51, 52)	Watson (2012)	"GOALS"	community	5-13		39	34	-	51%	

* Limited children's views presented, ** Unclear number of parent participants

2.2 Views Synthesis Findings - What do children, parents and providers feel are key features of LWMPs?

As illustrated in figure 2.2a below, discussions about LWMP experiences largely focused on aspects of the programmes themselves; either the content of the programme or the structure of the programme. However, parents and children also made clear that the wider context of families' lives shaped their needs and were fundamental to how the programmes were experienced. Although none of the studies explicitly asked participants about bullying and stigma, these issues were noted by participants in all studies as being a ubiquitous backdrop to participants' lives. We do not present an in-depth analysis of these contextual issues but illustrate them here because of their relevance to particular themes around programme content and structure. Stigma, bullying and support all linked to issues around self-esteem and were central to the desire for peer support through group delivery as well as to the need for physical activity sessions which provided 'safe' opportunities to be active. Healthy eating sessions and behaviour change strategies directly addressed challenges raised by the obesogenic environments children experienced, through cooking, shopping and other practical guidance.

Figure 2.2a: Factors perceived by children, parents and providers to moderate the success of LWMPs.



Box 2.2: Overview of findings on the factors perceived to moderate the success of LWMPs

Overarching themes	Sub-themes	Section
Programme content	<ul style="list-style-type: none"> • Children, parents and providers discussed the three key aspects of LWMP content, physical activity, healthy eating and behaviour change:- <ul style="list-style-type: none"> ○ Physical activity sessions were widely perceived to be a <i>positive</i> and <i>significant</i> feature of LWMPs. ○ Practical healthy eating sessions were <i>valued</i>, although didactic information about healthy eating education was negatively viewed. ○ Practical health behaviour change strategies were <i>less frequently discussed</i>, however those who did discuss them, were <i>consistently positive about them</i> 	<p>2.2.1</p> <p>2.2.2</p> <p>2.2.3</p>
Programme structure	<ul style="list-style-type: none"> • Children, parents and providers discussed six elements of programme structure:- <ul style="list-style-type: none"> ○ Group delivery of services and family involvement were aspects of programme structure that were <i>widely discussed</i>; views were consistently <i>emphatic</i> and <i>positive</i>. ○ Views about the necessity of ongoing support after the intensive period of the programme were <i>consistent</i> and <i>emphatic</i> ○ Views about the breadth of programmes (i.e. a focus on broader healthy living and psychosocial outcomes rather than just weight management) and provider support were <i>consistently positive</i> but <i>less prevalent</i>. ○ Perspectives on programme practicalities (e.g. the timing and venue of programmes) were <i>less prevalent</i> and <i>highly divergent</i>. 	<p>2.2.4</p> <p>2.2.5</p> <p>2.2.6</p> <p>2.2.7</p> <p>2.2.8</p> <p>2.2.9</p>

2.2 Experiences of lifestyle weight management programmes: Which LWMP features do users and providers perceive to be critical for success?

This section explores views on the content and style of LWMPs. We examine children's, parents' and providers' perspectives on different LWMP features to consider:-

- Which LWMP features do children, parents and providers discuss?
- How critical are different features perceived to be?
- How are individual features perceived to enable successful weight management; i.e. do they motivate LWMP attendance or initiation and maintenance of healthy behaviours?
- How are they best delivered?

Which LWMP features do service users and providers discuss?

LWMP features within **nine domains** were highlighted in discussions of experiences of LWMPs; three of these relate to programme content and six relate to programme structure. The nine domains were inductively derived from the studies; i.e. they reflect the key themes and issues reported in the views studies. Some features were **widely and enthusiastically valued**, while views about others were **less prevalent** across the studies or **not consistently positive**. Discussions also emphasised how **contextual issues** such as obesity-related stigma and bullying, and support from extended family and friends, were also pertinent to the experience and potential success of LWMPs. Table 2.2 below provides an overview of the nine domains, including **descriptions** of the nature of each, along with example participant views to illustrate the **pertinence** of each theme, and information on the **extent** and **consistency** of available evidence.

Table 2.2: Overview of the domains discussed by users and providers of LWMPs

Domain	Domain description	Extent of data: No. of studies in which domain is discussed	Emphasis/pertinence of theme: example quotes	Consistency of views
Physical activity sessions	Active games or sports provided to children (and in some cases parents) as part of the programme or as taster sessions, or information sessions about physical activity.	Child: 8/8 Parent: 8/10 Provider: 4/4 NB: 3 studies did not provide physical activity sessions (40, 42, 44)	<i>"The team games were good. Boost their confidence to join in with their mates. Cause some of these kids are really isolated so they need team sports to encourage them to join in"</i> Parent, (3) (p.177)	Consistently positive reports from children and providers. Mostly positive reports from parents but some anxiety from parents in 3 studies about their own involvement.
Healthy eating sessions	Information sessions about diet and nutrition, visual demonstrations or practical sessions involving cooking or tasting new foods.	Child: 4/8 Parent: 8/10 Provider: 2/4	<i>"The portion sizes [session] was very good. We are eating way too much of everything and need to cut down."</i> Parent, (41) (p455) <i>"The best bit I liked was making the bread."</i> Child, (41) (p326) <i>"The diet person is just gonna (going to) tell us stuff we already know anyway."</i> Parent (39) (p1297)	Although children consistently reported enjoying cooking and tasting sessions , some reported not enjoying didactic information sessions. Parents also consistently enjoyed cooking and tasting, but views were divergent about information sessions with some parents valuing it and others suggesting it was not necessary.

Domain	Domain description	Extent of data: No. of studies in which domain is discussed	Emphasis/pertinence of theme: example quotes	Consistency of views
Practical health behaviour change strategies	Practical behaviour change strategies such as goal setting and parenting skills such as role-modelling.	Child: 3/8 Parent: 6/10 Provider: 2/4	<i>"The challenge charts you gave us, he loved it, loved it. Yeah he absolutely thought that was brilliant, and it was competition cause his brother joined in" Parent (3) (p176)</i>	Consistently positive discussions of strategies for how to change behaviour.
Group delivery	Programme is delivered through group sessions rather than individuals or parent-child dyads, such that parents and children are able to engage with peers in similar situations.	Child: 6/8 Parent: 8/10 Provider: 4/4 NB: 3 studies did not involve regular group sessions (40, 42, 44)	<i>"Coming here with other children similar to himself and getting to speak to other parents dealing with like the same issues is really helpful for us." Parent (2) (p236)</i> <i>"I found them fun because I was surrounded by different people who were in the situation that I was in" Child (female) (38) (p8)</i>	Consistently positive appraisals of group delivery by children and providers. Mostly positive reports from parents but some negative views from parents suggesting it deterred them from attending.
Family involvement	Involvement of the wider family in programmes, including children and parents, with some involving siblings also.	Child: 5/8 Parent: 10/10 Provider: 3/4 NB: 3 child studies in which it is not discussed are those in which child views were limited.	<i>'Providers valued the active involvement of parents and carers and saw a family approach as crucial: "I think that's key... because if you don't change the parents, then nothing changes at home..." Provider (38) (p7)</i> <i>"how can I tell her "this is what you need to do" if she's not seeing me do it" Parent (1) (p118)</i>	Consistently positive perspectives on family involvement from children and providers. Mostly positive reports from parents but some tensions around family involvement in one study .

Domain	Domain description	Extent of data: No. of studies in which domain is discussed	Emphasis/pertinence of theme: example quotes	Consistency of views
Ongoing support	Support that extends beyond the intensive period of programme delivery. Programme activities may attempt to prepare participants for after the programme's end.	Child: 2/8 Parent: 8/10 Provider: 2/4	<i>'once the programme was over, [participants] missed the support of a "safe" group. The few families who had attended follow up activities set up locally had been disappointed that none of the families they knew were there.'</i> Authors (38) (p10)	Parents' and children's views were consistent and emphatic , they described long-term or ongoing support as necessary for maintaining motivation to engage in healthy behaviours.
Programme breadth	Programmes portrayed and perceived as having a more holistic focus on healthy lifestyles and family interactions, and on psychosocial outcomes rather than just weight loss.	Child: 4/8 Parent: 10/10 Provider: 3/4	<i>"Losing weight is one little corner of the jigsaw. There was so many other jigsaw pieces that ... make the programme, that the weight loss hasn't been the ultimate thing, it's been a perk."</i> Parent, (41) (p321)	Views were consistent and emphatic , children, parents and providers appreciated a broader more holistic approach than a pure focus on weight loss. However, parental views were varied with regards to reasons for attending in the first place.
Provider support	Nature of support offered by programme providers, and characteristics of providers.	Child: 5/8 Parent: 6/10 Provider: 2/4	<i>"They're friendly and kind, and they boost your confidence."</i> Child (37) (p1222). <i>'Repeatedly the parents talked of looking for "someone" outside of the family who could motivate the child and in particular give the child "a wake-up call"'</i> author (42) (p178)	Where discussions of providers' characteristics emerged they were positive in the main , with an emphasis on the value of having access to an independent third party.

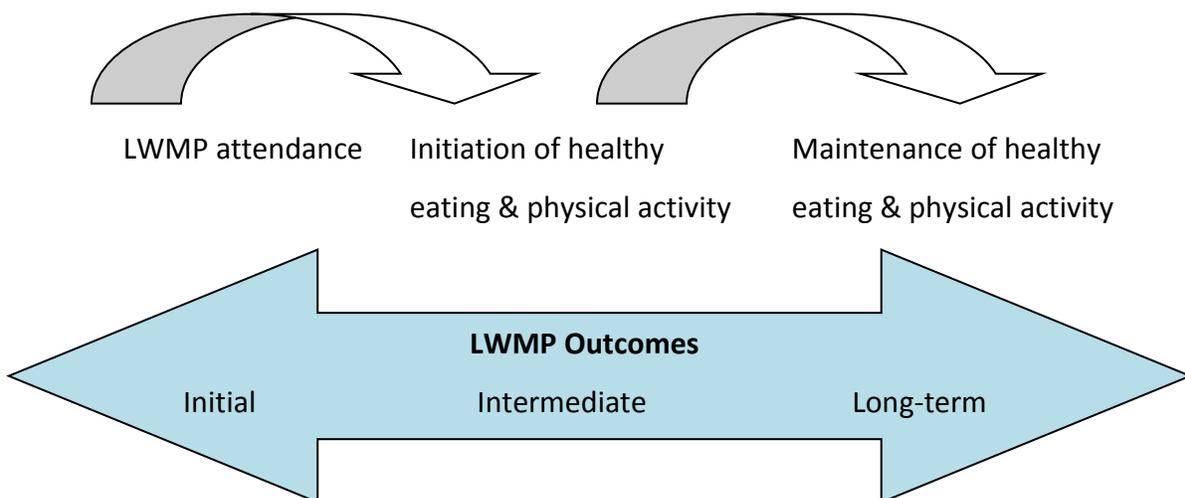
Domain	Domain description	Extent of data: No. of studies in which domain is discussed	Emphasis/pertinence of theme: example quotes	Consistency of views
Programme practicalities	The location, timing, length of sessions and overall length of programme.	Child: 1/8 Parent: 10/10 Provider: 4/4	<i>‘There was no consensus from the parents on the length of each session [...]’ ‘I see making it a bit longer, an extra half an hour or something, Because it does go quite quick, actually I was quite surprised how the time went’ [...]’ ‘I found 2 1/2 hours a little excessive. Maybe one hour would be better, not breaking up into separate groups.’” Author, parents, (41) (p319-20)</i>	There is little indication that children considered practicalities an issue. Although parents in two studies were specifically prompted to discuss such issues as programme timing and venues, parents in another five did raise concerns in these areas, suggesting the salience of the issue for them. However, parental views were highly divergent with regards to optimum programme practicalities. Providers made limited comments concerning programme venues.

How critical are different features perceived to be for LWMP success?

The evidence presented in Table 2.2 above illustrates how children, parents and providers may value some LWMP features more than others; for example children in all studies provided emphatic endorsements of physical activity sessions, whilst no children in any studies discussed programme practicalities. In addition, views with regard to some features were largely homogenous, whilst for other features opinions varied.

The following sections of the views synthesis examine the perceived importance of each domain and how each domain is perceived to influence the three key behaviours on a simplified hypothetical pathway to healthy behaviour change as illustrated in figure 2.2b. The hypothetical pathway is based on the premise that for LWMPs to have any impact on changing the behaviours of service users, they must first be successful at motivating LWMP attendance. Once participants are engaged, LWMPs can then seek to motivate participants to initiate healthy eating and physical activity. If a long-term healthy weight is to be achieved, however, the ultimate aim of any LWMP must be to enable families to maintain their own weight-related behaviours. Therefore, each section considers the impact of each domain on these three kinds of outcome.

Figure 2.2b: Pathway to healthy behaviour change



2.2.1 Programme content: Physical activity sessions

Box 2.2.1: Overview of findings on physical activity sessions

Overarching themes	Sub-themes
How critical are physical activity sessions perceived to be?	<ul style="list-style-type: none">• Views were consistently positive across all studies in relation to physical activity sessions for children; children’s views were particularly positive.
How are physical activity sessions perceived to act?	<ul style="list-style-type: none">• <i>LWMP attendance</i>: Parents, providers and children in several studies described how children enjoyed physical activity sessions.• <i>Initiation of healthy behaviours</i>: participants described how experience of physical activity demonstrated the enjoyment and fun that could be had and increased confidence in participating.• <i>Maintenance of healthy behaviours</i>: In several studies participants associated sessions with children starting to be more physically active outside of the programme.
How are physical activity sessions perceived to be best delivered?	<ul style="list-style-type: none">• Views on whether parents and children should have joint or separate sessions were mixed.• Parents and children emphasised fun and enjoyment when describing sessions.

Most of the programmes discussed provided physical activity sessions for children (2, 3, 37, 38, 40, 41) and, in some cases, for parents too (1, 39, 43)⁵. Physical activity sessions were discussed in most studies with most participant types: in all eight studies exploring children’s views, by parents in eight of the ten studies reporting parents’ views (1-3, 39-41, 43, 44) and by providers in all four studies presenting their views.

Sessions ranged from games, such as bench or dodge ball, or “stuck in the mud” (51) (p27), to activities such as swimming and taster sessions for other sports or activities.

⁵ The LWMPWMP in Visram et al’s paper (45) did not include a fixed programme; instead individuals were referred to specific activities according to their need. For this reason it has not been included in discussions of programme content.

Three programmes did not provide activity sessions but offered either access to leisure facilities (44) or advice about physical activity and sedentary behaviour (40, 42).

How critical are physical activity sessions perceived to be?

Across all studies participants indicated the benefits of providing children with experience of physical activity through sessions, rather than just providing advice. Although views about physical activity sessions were emphatic in all 11 studies the value of these sessions is indicated in two studies in particular. A 'persisting theme' in one study was that parents would have liked more physical activity for themselves and their children during the programme (41) (p322). In another, all but one of the participants (who included children, parents and providers) agreed that physical activity was a 'necessary' accompaniment to nutrition and psychology components (2). In all eight studies presenting their views children made positive comments on physical activity sessions (1, 3, 37, 38, 43)(36, 37, 40, 44, 46)(36, 37, 40, 44, 46); in some cases it was their favourite part of the programme (41). Whilst none of the studies explicitly examined views on physical activity in relation to gender, available quotes indicated that both boys and girls enjoyed physical activity sessions.

How do physical activity sessions motivate attendance at LWMPs?

Physical activity sessions were indicated as motivating initial and continued attendance at LWMPs through providing positive experiences for children. Increases in children's confidence to take part in physical activities were emphasised both by children (1, 37) and parents (1, 3) as valuable outcomes from these sessions, for example -

"The team games were good. Boost their confidence to join in with their mates. Cause some of these kids are really isolated so they need team sports to encourage them to join in" parent (3) (p177)

The authors of another study claimed that children continued to participate in the programme, *“because they enjoyed the experiences, felt more confident in their physical skills and better about themselves in general for attending.”* (37) (p1221). Common to many children’s accounts were the fun and enjoyment derived from activity sessions (1, 38, 41, 43, 44).

How do physical activity sessions motivate initiation of healthy behaviours?

Many studies emphasised the value for children of having opportunities to be active with others like themselves, describing how it finally afforded them a way of enjoying physical activity (see section 2.2.5 on group activities). Descriptions included contrasts with experiences of physical activity at school. In one study children noted how *‘everyone was the same and no-one was left out’* and that this gave them *‘confidence to join in’* p123 (1). In two studies, providers (44) and parents (3) noted that children were beginning to enjoy physical activity, for example : -

“His exercise has improved too. There are lots of clubs after school, but he didn’t actually go to any of them but now he’s happy to join in, and he’s made new friends... and now he thinks things are fun which is different to before” parent (3) (p175)

How do physical activity sessions encourage maintenance of healthy behaviours?

Views presented in six studies linked participation in a programme’s physical activity sessions to physical activity outside of the programme (1, 3, 41, 43, 44). In one study, interviewees described how children *“overwhelmingly [reported] feelings of increased competency in ... physical activity”* that extended to other settings, *“from ‘playing out’ to school P.E. lessons”* (37) (p1221). Similar comments were presented in other studies, for example:

“I feel more confident in joining in stuff in school. I never wanted to do sport but now I’ve been playing every afternoon.” child (51) (p37)

In five studies parents or children reported that since joining the programme they had started to do more activities as a family (1, 3, 41, 43, 44).

How are physical activity sessions perceived to be best delivered?

Five studies presented views about whether physical activity sessions should be delivered separately for children and adults, or as joint sessions (1, 3, 39, 41, 43). Section 2.2.5 contains further findings about family involvement more generally. Views were mixed about parental participation in physical activity. Some parents preferred not to be involved in physical activity sessions (3, 39, 41, 43) although parents in two of these studies (3, 41) described how the unpressurised and sensitive handling of this aspect of the programme enabled them to engage and enjoy it.

“Getting the parents to join in was brilliant cause, you know, I would never do any exercise but it was done in a different way and it was just fine.” Parent (3) (p178)

In contrast, parents in three studies were keen to have joint physical activity sessions with children (41, 43, 44) and described several ways in which it might help long-term change. Parents felt that:- the games they played in the programme could then more easily be played at home (41, 43), doing sport together would encourage spending more leisure time as a family doing sports (44) and that it enabled them to be a role model to their kids who would see them enjoying themselves (41).

There were no views in the studies as to how much or how often physical activity sessions should be provided but there was a suggestion that a series of sessions may be essential to foster the growth of self-efficacy and confidence:-

*"It's aiming to teach me that I'm stronger and building my sports confidence.
. . . The first time I came I wasn't confident, but the more times I came the
more confident I got." child (37) (p1221)*

While the value of different types of physical activity session was not explored directly, it was a clear that experiencing enjoyment and reduced feelings of pressure to perform were important. The word 'fun' in particular is prominent in many of the quotes provided to illustrate both children's and parents' experiences. As one child commented:-

*"...you can lose weight with fun-ness ...instead of just doing twenty five laps
round the thing you can play sports football tennis or even just walking round
the park a couple of times with your mates." child (1) (p122)*

2.2.2 Programme content: Healthy eating sessions

Box 2.2.2: Overview of findings on healthy eating sessions

Overarching themes	Sub-themes
How critical are healthy eating sessions perceived to be?	<ul style="list-style-type: none">• Parents and children reported that they valued interactive and practical healthy eating sessions.
How are healthy eating sessions perceived to act?	<ul style="list-style-type: none">• <i>LWMP attendance</i>: A perception of overly didactic or simplistic information provision/education was linked by some parents to lowered attendance.• <i>Initiation of healthy behaviours</i>: Practical sessions such as cooking, tasting new foods were seen to motivate changes.• <i>Maintenance of healthy behaviours</i>: Sessions about reading labels, portion size guidance and practical strategies were reported to have helped families create a 'health friendly' environment.
How are healthy eating sessions perceived to be best delivered?	<ul style="list-style-type: none">• Interactive, visual and practical sessions were said to be engaging and to motivate behaviour change.

All of the programmes discussed in the views studies included sessions on healthy eating but these varied from didactic education to more practical exercises. Participants in eight of the 11 studies (1, 3, 38-43) provided views on these sessions; children's views were presented in four studies (1, 38, 41, 43), parents' views in eight (1, 3, 38-43) and providers' views in two (38, 41).

How critical are healthy eating sessions perceived to be?

Views about sessions on healthy eating were divergent. In six studies children and parents consistently reported appreciation and enjoyment of practical sessions such as cooking and food tasting (1, 3, 40-43). However, in four studies some parents had anticipated programmes as providing information about what they should and should not eat and were concerned that this might not be that useful (39-42) for example:

'I thought we would actually be handed a menu and told just to follow it. I thought it would be like a certain healthy foods we had to eat' parent, (41) (p162)

Children in three studies reported not liking didactic, 'taught' sessions (41) and liking more interactive sessions (1, 43) and fun materials with pictures and less text (1).

'[what have you not liked about the programme?] Ah, the teaching part. Just being taught.' Child, (41) p327

How are healthy eating sessions perceived to motivate LWMP attendance?

Participants did not explicitly link provision of a healthy eating component with their own attendance, but in two studies it was noted that parents who were concerned about a programme's focus on information provision around diet were more likely not to have attended (39, 40). One parent who had withdrawn early had stated, *"Blah blah blah, the diet person is just gonna... tell us stuff we already know anyway."* (39) (p1297). However, parents and children in six studies consistently reported enjoyment of more practical healthy eating sessions (1, 3, 40-43). Cooking sessions were particularly enjoyed by parents and/or children in four studies (1, 3, 41, 43) and parents in a fifth study reported wanting cooking sessions for themselves and their children (42).

How are healthy eating sessions perceived to motivate initiation of healthy behaviours?

As well as enjoying practical healthy eating sessions participants found them helpful (1, 3, 40-43). These sessions included activities such as cooking, tasting new foods, reading labels and shopping, guidance about portion control and other visual activities for example to show sugar content. In three studies parents or children commented on the value of children being encouraged to take some control over cooking (3, 38, 41), for example: -

“The cooking was brilliant. We all loved that... the kids loved it cause they got to do most of it.” Mother (3) (p178)

In four studies, parents reported that tasting or cooking sessions led their children to try new foods (1, 3, 41). Parents in five studies (3, 40-43) and a provider in one study (41) valued the guidance on portion size for raising awareness, for example:- *“Portion control I found really quite shocking really. We were having too big a portions and I’ve really tried to think about what goes on the plate.” Mother p175 (3)*

How are healthy eating sessions perceived to motivate maintenance of healthy behaviours?

Parents in six studies linked guidance on practical strategies to changes at home, with one study describing steps that parents reported taking to “create a more health-friendly environment” (p117) (1). Section 2.2.5 presents more on creating a health-friendly environment in the home. Participants in six studies described changes to the food they bought (for example no longer having biscuits in the house) or to the way they cooked or prepared food (for example cutting up fruit to make it more easily accessible) (1-3, 41-43). For example:-

“at home we've had different fruit in our house in our fruit bowl and we've had less chocolate” child (1)p124

Parents in three studies commented favourably about practical sessions on shopping, such as explaining how to read nutritional labels or providing other shopping tips (3, 41, 43); parents in a fourth study desired such sessions (42).

“I like the supermarket week. A great idea. Actually showing you what's good in the shop and what's not and reading the packaging properly.” mother (3) (p177)

How are healthy eating sessions perceived to be best delivered?

Parents and children consistently reported enjoying interactive, practical and visual sessions, particularly those that were applied and relevant to their everyday lives (1, 3, 40-43). These more engaging approaches were noted to support behaviour change:-

“We stopped eating doughnuts...after you showed us the amount of sugar that was in a doughnut... I have that imprinted on my memory that bag of sugar.” parent (51) (p30)

2.2.3. Programme content: practical health behaviour change strategies

Box 2.2.3: Overview of findings about practical health behaviour change strategies

Overarching themes	Sub-themes
How critical are practical health behaviour change strategies perceived to be?	<ul style="list-style-type: none">• Practical health behaviour change strategies were emphasised by participants in fewer studies than physical activity and healthy eating, although views, when they emerged, were consistently positive
How are practical health behaviour change strategies perceived to act?	<ul style="list-style-type: none">• <i>LWMP attendance</i>: reports included no association of this kind• <i>Initiation of healthy behaviours</i>: In several studies these strategies were seen as positively changing behaviour• <i>Maintenance of healthy behaviours</i>: These strategies were reported to have encouraged both children and parents to take responsibility for their behaviours
How are practical health behaviour change strategies perceived to be best organised?	<ul style="list-style-type: none">• Parents emphasised the value of goals that were small or realistic. Providers, parents and children indicated that behaviour change strategies worked well when they encouraged both parents and children to take responsibility for change.

Children's views about practical behaviour change strategies were presented in three studies (1, 2, 41), parents' views in six studies (1-3, 40-42) and providers' views in two studies (2, 41). All of the lifestyle weight management programmes focused on in the views studies incorporated some kind of behaviour change strategy. Examples of behaviour change strategies included parenting skills, using goals or monitoring and psychological support.

How critical are practical health behaviour change strategies perceived to be?

Health behaviour change strategies were discussed in six of the 11 studies (1-3, 40-42) and the views that were presented were consistently and overwhelmingly positive. Two broad types of behaviour change strategies were discussed. The type most commonly discussed by providers, parents and children was goal setting and monitoring which was

discussed in six studies (1-3, 40-42). The second type was parenting skills training; such as discipline and boundaries, praise and responsibilities. This was discussed in four studies (1-3, 41). Parents and providers discussed parenting techniques such as the use of praise and encouragement, being a positive role model and using rewards and treats. With regard to behaviour change aspects of the programme participants indicated that they were less interested in psychological approaches seeking to determine why there was a problem, but more in need of tips (48) or ideas (40) on how to make changes.

How are practical health behaviour change strategies perceived to motivate LWMP attendance?

Programme participants did not themselves explicitly link behavioural change strategies with their own attendance, although in one study participants (including those who chose not to attend) explained that they “*were hoping for psychological support with parenting issues*” (40) (p239). However, goals were viewed positively by and for children, who enjoyed using them (1, 3, 40, 42); enjoyment was a reason given for attendance.

How are practical health behaviour change strategies perceived to motivate initiation of healthy behaviours?

The use of goals and monitoring were described as motivating initiation of healthy behaviours among parents. In five studies, parents praised the use of goals for motivation (1, 3, 40-42). In two of these (40, 41) stickers were specifically mentioned as a useful means of monitoring, as well as being a reward or motivation in themselves. Parents found monitoring useful, particularly at the beginning of programmes, as it raised their awareness of their own, and their child’s, eating or physical activity habits (1, 3, 42). Parents in three studies felt that parenting skills training also helped change behaviour by raising their awareness (1, 3, 41). For example:-

“The role model stuff was like wow, I didn’t realise how much they looked up to us, until we did it, that was a bit of a shock...” mother, (3) p176

Parents also provided examples of how parenting skills training had led to behaviour change in relation to giving praise (41) or reward systems (1, 3, 41, 42) and many noted positive outcomes for families, for example:-

“Reward systems have led to increased family-time. Less of a demand for food, less hassle and arguments over food. Reward systems encourage the behaviour you want and now expect.” Parent (41) p453

How are practical health behaviour change strategies perceived to motivate maintenance of healthy behaviours?

Parents and children in several studies linked goal setting and monitoring to maintenance of healthy behaviours (1-3, 42). In one study, the use of goals was described as a ‘persistent’ theme in discussions with parents, who saw them as helping their children, *“make and continue with lifestyle changes”* (p469) (50); and in another, there was a *“strong feeling”* that monitoring helped with keeping to goals (49) (p167). In some studies self-monitoring tools were described as helpful (1, 3).

“M had a little project to do each time like a worksheet that he had to stick to before he got his reward at the end of it, so it kept the momentum going.” Parent (42) p163-4

“I like it when we set a target to do more exercise at home” Child (1) p143

Parenting skills were also linked to longer-term behaviour change. For example, the use of treats was discussed in four studies (1, 3, 41, 42) and parents and children reported reducing the frequency of ‘junk food’, to once a day or only on ‘treat days’ (41) or using physical activities such as swimming or the gym as a reward (41).

“Family rewards we had them but they were all wrong and far too often, for no reason. They involved food and no activity... it was not a reward it was just a way of life....” Mother p288 (41)

How is the use of practical health behavioural change strategies best achieved?

Parents emphasised the value of goals that were small or realistic (1, 40-42). These were considered more feasible to maintain in the long term.

“it's the small changes that are realistic and if you can keep that going for the rest of your life .. .it might sound trivial like having breakfast every day but a change like that is important long term isn't it” mother (1) p115

There was value seen both in goals set by providers (3, 40) and those that children (3, 42) or parents (41) set for themselves; however one study reported a less common view, that easier goals may be chosen when self-selected(42).

2.2.4. Programme structure: Group activities

Box 2.2.4: Overview of findings on group activities

Overarching themes	Sub-themes
How critical are group activities perceived to be?	<ul style="list-style-type: none">• Children widely reported valuing group activities with other children. Reports from parents supported this view.• Parents also reported valuing the social support from group sessions for themselves.
How are group activities perceived to act?	<ul style="list-style-type: none">• <i>LWMP attendance</i>: parents described being brought together with people similar to themselves as helping them to attend. Whilst not explicit, children also indicated that group activities might motivate attendance.• <i>Initiation of healthy behaviours</i>: parents felt their children's increased levels of physical activity resulted from experience of being with others like themselves.• <i>Maintenance of healthy behaviours</i>: Group physical activity sessions were described as increasing confidence to take part in group activities outside of the LWMP.
How are successful group activities perceived to be achieved?	<ul style="list-style-type: none">• Participants indicated that skilled facilitators helped to create a safe environment for mutual learning and support in group sessions

Children's views on group sessions were reported in six studies (1, 2, 37, 38, 41, 44), parents' views in eight studies (1-3, 38, 39, 41-43) and providers' views in all four studies reporting their views (2, 38, 41, 44). Participants in eight of the eleven studies were reflecting upon a programme which had run group sessions either for children, parents or both (1-3, 37-39, 41, 43); a ninth also offered occasional group activities to some participants (44).

How critical are group activities perceived to be?

Participants in all nine studies made positive comments about the group nature of programmes and it was a prominent theme in many of them. Some of the parents who

had seen only practitioners (i.e. had not experienced group sessions with peers) commented that group sessions might help improve their experience (42).

How are group activities perceived to motivate LWMP attendance?

In two studies participants explicitly linked getting to spend time with similar others in group sessions and feeling more accepted to their own continued attendance (1, 2). One parent, for example, said, *“coming here with other children similar to himself and getting to speak to other parents dealing with like the same issues is really helpful for us and you don’t feel like you’re being looked at funny and [child] actually looks forward to coming.”* Parent (2) (p236).

Whilst not explicit, children also indicated how group activities might motivate attendance. In many studies children described an increased sense of feeling accepted or supported by their peers (1, 2, 37, 38, 41, 44) or emphasised making new friends (1, 3, 37, 38, 41). As one child put it,

“The best bit about our group is that we always stick together and there’s no-one to hurt you and if you’re friendly then they usually come to you and help you.” Child (41) (p326)

Parents also saw group programme activities as having such benefits for their children (1, 2, 39) and mentioned physical activity sessions in particular in this respect, for example

“James (child) can make friends with other kids the same who [may] not be fantastic at football and feel really bad, but they can play on the same level you know.” Parents (39) (p1297)

Parents in six studies also valued the group nature of programmes for themselves (1-3, 37-39, 41-43), noting that the group programmes had seen them making friends and

feeling less socially isolated. They also valued the opportunities offered for talking through issues and exchanging ideas with others with similar experiences. For example:-

“... it was actually just talking to the other parents, finding out you weren't alone in this, that was, I think, the most, you know, having an open forum to say my kid does that too, cause you feel so guilty.” Parent (3) (p177)

Children, parents and providers all talked in terms of either children or parents benefitting from spending time with people similar to themselves (1-3, 38, 39). In contrast, parents and children in two studies were deterred from joining a lifestyle weight management programme as they felt it would create stigma and 'labelling' (38, 39).

How are group activities perceived to motivate initiation of healthy behaviours?

Participants tended not to link the group nature of activities to healthy behaviours, although it is worth noting that in programmes where physical activity sessions were offered, these were group-based activities (1-3, 37-41, 43). However parents in one study were reported as feeling that children joined in with activities they would not take part in elsewhere, because they had gained confidence from being with others like themselves (1). This idea is supported by a separate study, where a girl says about group physical activity sessions, *“I found them fun because I was surrounded by different people who were in the situation that I was in, in terms of being overweight and finding exercise difficult.”* Child (38) (p8).

How are group activities perceived to motivate maintenance of healthy behaviours?

As described above in the section on physical activity sessions, six studies linked participation in physical activity sessions with similar others to increased confidence in

their ability to be active and increased self-esteem, which was in turn perceived to be linked to physical activity outside of, or after, the programme (1, 3, 41, 43, 44).

How are successful group activities perceived to be achieved?

Children (37) and parents and providers (38) stressed the importance of providers having good group management skills. Parents in two studies appreciated how group facilitators had managed to create a non-judgmental atmosphere where people felt safe to share their experiences with each other (1, 41). Children made similar points in two studies (1, 37), for example *“people from [name of programme] don't care if you're overweight, obese, tall, thin, small, midgy, anything. (Boy)”* (1). There was little commentary on the optimum size of groups, or how similar the others in the group need to be, for example in terms of age, gender or ethnicity.

2.2.5. Programme structure: Family involvement

Box 2.2.5: Overview of findings on family involvement

Overarching themes	Sub-themes
How critical is family involvement perceived to be?	<ul style="list-style-type: none">• Evidence from all eleven studies suggests that parents, children and providers felt family involvement to be critical for an effective programme.
How is family involvement perceived to act?	<ul style="list-style-type: none">• <i>LWMP attendance</i>: Some parents saw family involvement as a motivation for attending.• <i>Initiation of healthy behaviours</i>: Joint participation by family members was seen as aiding changes at home.• <i>Maintenance of healthy behaviours</i>: It was perceived that a lack of support from other family members and extended family could lead to an unsupportive food environment.
How is successful family involvement perceived to be achieved?	<ul style="list-style-type: none">• Participants offered pros and cons of both joint and separate child and parent sessions.• Parents and children reported that they enjoyed having physical activity and practical sessions together, but felt that discussion sessions would be more useful when separate.• Providers appreciated the value of a mixed approach.

All of the LWMPs under discussion in these studies included some form of family involvement, where parents or other family members attended and/or participated in the programme. The benefits of involving families were explicitly discussed or implied in all 11 included studies, and this was an issue raised by children in five studies (1, 2, 37, 38, 41), parents in all ten studies presenting their views and providers in three studies (2, 38, 41). Parents and providers indicated that immediate and extended family members could have a powerful influence on children's successful behaviour change and that this influence could be either positive or negative.

How critical is family involvement perceived to be?

Parents in seven studies were explicit that they liked or felt it important that the programme involved the whole family (1-3, 39, 41, 43, 44). Five studies reported views from children that were consistent with this (1, 2, 37, 38, 41); in particular, two of these studies (1, 41) reported that children described family involvement when asked what features of the programme they especially liked. Providers in all three of the provider studies were emphatic that family involvement is a positive element.

Both families and providers were clear that they perceived family involvement to be critical to the success of programmes, for example:-

'Providers valued the active involvement of parents and carers and saw a family approach as crucial: "I think that's key... because if you don't change the parents, then nothing changes at home..."(Lucas) p7

Providers and parents in four studies recognised the importance of parental responsibility (1-3, 41), and children in another study noted how their parents or carers supported their attendance (37). However children and parents in four studies also noted that children enjoyed and were motivated to take responsibility for their health behaviours (1, 38, 41, 42). In three studies, parents explicitly discussed how responsibilities and decision-making were shared between parents and child (1, 3, 41). In three studies, parents discussed their role in supporting and encouraging their children (1, 2, 42). Parents distinguished their role from a controlling one, describing 'overseeing' and encouraging whilst their child took responsibility for behaviour change (1, 2, 42). In one study it was noted that among families who did not achieve weight loss, there was a sense that, rather than the family or child taking responsibility for their own lifestyle change, this was the clinic's role (40). Describing an approach that shared responsibility, one said, *"children are more aware nowadays, none of us like being told to do things and so it was like forming a partnership and it worked" parent p166 (42).*

How is family involvement perceived to motivate attendance?

Three studies (39, 43, 44) explicitly linked family involvement to attending sessions. For example, one parent's reasons for attending the LWMP were:-

"Mostly because, me and [daughter] are involved as well, especially because mum is involved. And the people there understand him, know what his condition is. He feels more comfortable". Bangladeshi mother (43) (p61).

However some children noted discomfort in opening up in a group session with both parents and children (1). In another study, parents had mixed views, with some wanting more joint sessions while others recognised the benefits of having separate parent and child group sessions (41).

"[I feel] strange because you don't really talk about yourself in front of your parents do you...you wouldn't do it in the privacy of your own home ... so why would you do it here in front of other people's parents" child (1) p135

How is family involvement perceived to motivate initiation of healthy behaviours?

Whilst practitioners were explicit in their view that family involvement was vital for engaging in healthy behaviours, the views of parents and children were less explicit about the link between family involvement and this outcome. However, widespread commentary from children and parents exemplified *why* it might be critical.

"at home we've had different fruit in our house in our fruit bowl and we've had less chocolate because my mum used to buy big boxes of chocolate and they used to be out where you could see them and when you can see them

you tend to eat them don't you" child (1) p124

Parents in three studies (1, 40, 42) specifically mentioned that they valued the involvement of their wider family in a LWMP. A sibling of one young participant illustrated how difficult being healthy could be if not all family members were 'on-board'.

"She [mother] still has white bread, don't you...Which means then [daughter] technically gets white bread because that's what mam likes" sister (38) (p622)

In fact, many of the examples illustrating the critical value of family involvement relate creating a supportive health-promoting home environment whilst others relate to negative experiences where not having family and friends on-board jeopardised engagement in healthy behaviours.

"It's hard doing it as a family, because my son will come in and stuff himself with biscuits and she'll say, well I want to do that and I, you know, just have to, so now we just don't do the biscuits, we don't have the biscuits very often, so then it's just not an issue" parent (3) p176

How is family involvement perceived to motivate maintenance of healthy behaviours?

Behaviour in the longer term was described, in particular, as being negatively affected by significant others. Parents in three studies described how other members of the immediate family not in the programme could undermine engagement with healthy behaviours (1, 3, 42). For example:-

"He sees his brother. "he's gonna eat pizza why can't I eat pizza", and that's part of our problem" parent (49) (p37)

Comments by parents on the negative influence of *extended* family were even more emphatic and widespread (2, 38-42). Grandparents and others were described as 'sabotaging' (40) the efforts of those engaged in the programme by being critical of the need for it, or by creating an unhealthy environment. For example, one parent described difficulties with, "*My mum with the donuts and their dad with wanting to take them to McDonalds*" parent (2)(p238).

Positive appraisals of creating a healthy culture and environment in the home were also provided. Parents described how changing habits as a whole family made maintenance easier, for example "*... when [my daughter] is motivated I stay motivated (mother A1)*" (1)(p117).

How is successful family involvement achieved?

Whilst opinion was consistent across the studies about the need for family involvement, there was less consistency about how this is best achieved. Parents in six studies (1, 3, 39, 41, 43, 44), children in one study (1) and providers in one study (41) discussed whether joint parent and child sessions were preferable to separate parallel sessions; some emphasised benefits of joint parent and child sessions, whilst others indicated a preference for separate parallel sessions.

The perceived benefits of having separate parent and child sessions included:- encouraging increased autonomy and confidence in children (1, 41), enabling children and parents to express views that might be difficult in front of each other (1, 41), and the ability to tailor sessions to children's and parents' differing needs for knowledge and skills (41).

Joint sessions with children were reported by parents to be fun (3, 41, 43). In one study that explored children's views on the issue (1) some children reiterated parents' views about the difficulties of raising sensitive topics in joint sessions, whilst others enjoyed

playing physical activity games and doing activities with their parents. A provider in one study reflected on what they perceived to be the benefits of holding both separate sessions and joint sessions:-

“I think for some aspects of the programme it’s a very good idea doing separately. The children get a chance to have their own voice heard, sort of, innocent of whatever the family relationships maybe and the parents get a confidential space to talk about their concerns about the children, which it might not be appropriate for them to air in front of the children. Having said that some of the activities that we did together when the groups were very small, worked beautifully.” Provider (41) (p338)

2.2.6 Programme Structure: Ongoing support

Box 2.2.6: Overview of findings about ongoing support

Overarching themes	Sub-themes
How critical is ongoing support perceived to be?	<ul style="list-style-type: none">• Parents, children and providers all described long-term or ongoing support as necessary for maintaining motivation to engage in healthy behaviours.
How is ongoing support perceived to act?	<ul style="list-style-type: none">• Ongoing support was not discussed in relation to LWMP attendance and the initiation of healthy behaviours.• <i>Maintenance of healthy behaviours</i>: The loss of a support network was perceived to be the biggest impediment to maintenance.
How is ongoing support best perceived to be delivered?	<ul style="list-style-type: none">• Parents and children suggested that less intensive ongoing support could be sufficient for long-term motivation (e.g. continued access to physical activity resources or goals and monitoring tools).

Participants in eight studies discussed the topic of ongoing support for weight management, in terms of some form of support continuing after the programme had ended, such as communication or a lower level of involvement. Children’s views on the topic were presented in two studies (1, 2), parents’ views in eight studies (1-3, 38, 39, 41, 42, 44) and providers’ views in two studies (2, 38). It was often not possible to see from study reports what had been done in programmes to ready participants for life after the programme’s end.

How critical is ongoing support perceived to be?

Parents in all eight studies expressed ‘concern’ (3), ‘anxiety’ (1) or that they felt ‘frightened’ (1) about the programme ending and their ability to maintain healthy behaviours without support (1-3, 38, 39, 41, 42, 44). One was quoted as saying, “*I think it’s gonna be hard to keep up once we’ve gone n the group dismantles....*” (2) (p.237)

Such concerns were expressed far less frequently by children across the studies (1, 2). However, the author one study ultimately concluded, *“When it comes to leaving [LWMP], the overwhelming feeling from parents and children in this study was they wanted the support to go on for longer.”* (1) (p145).

The following section focuses specifically on maintenance of healthy behaviours since the issue of ongoing support bears little relevance to attendance at LWMPs or initiation of healthy behaviours.

How critical is ongoing support perceived to support maintenance of healthy behaviours?

In five studies (1, 2, 38, 41, 42) parents were explicit that it was the loss of the support network offered by peers and service providers that would be the biggest impediment to continuing with healthy behaviours. In two studies this was linked by parents to a loss of motivation (2, 3), with one quoted as saying, *“Since it’s stopped, you know, we’ve stopped going, we’ve lost eating more healthier. I don’t know why, and she’s stopped exercising as much you know. We’ve lost motivation for it all”* (3) (p179).

Parents in five studies were also concerned about the loss of exercise facilities (1, 3, 38, 39, 44). Others were concerned about the loss of goals and monitoring (1, 3, 42).

How might successful ongoing support be achieved?

Parents and providers in a number of studies made suggestions about ongoing support. Some parents were explicit that ongoing professional support was required (2, 41, 42) with some suggesting that this needed to continue for up to 18 months (42). Parents in two studies (2, 41) suggested that families be offered a second go at the course after a break. Authors of one study that had provided ongoing support in a screen-based

format reported that it was little used and deemed by parents to be inappropriate (38). Providers in another study (2) acknowledged the need for innovative strategies to maintain contact with the support network but also noted the need for interaction with similar others, for example:

“Setting up some type of external support network (right) erm . . . you know something that was accessible to the group involved . . . even if it was like a website or exchanging phone numbers.” Provider (2) (p235)

Parents also indicated that keeping in touch with their peer network would have been beneficial (2, 41). However, the one study in which this approach appears to have been employed noted that *“The few families who had attended follow up activities set up locally had been disappointed that none of the families they knew were there.” (38) (p10)*. Others implied that it would be beneficial to have continued access to physical activity services (39, 44) or goal-setting and monitoring materials to use after the course had finished (3).

2.2.7 Programme structure: Breadth of programme focus

Box 2.2.7: Overview of findings about breadth of programme focus

Overarching themes	Sub-themes
How critical is a broad programme focus perceived to be?	<ul style="list-style-type: none"> • Children, parents and providers appreciated a broader more holistic approach rather than a pure focus on weight loss.
How is programme breadth perceived to act?	<ul style="list-style-type: none"> • <i>Attendance at LWMP</i>: Most studies did not focus on this; those that did presented a variety of parental views with regards to reasons for attending in the first place • <i>Initiation of healthy behaviours?</i> Parents placed greater value on the programmes impact on psychosocial issues than on weight loss

Participants in all eleven studies touched on the breadth of programme focus; children's views in four (1, 37, 38, 44), parents' views in all ten and providers' in three (2, 38, 44). These discussions explicitly addressed the perceived importance of this aspect and its influence on programme attendance and indicated an impact on initiation of healthy behaviours. However, the issue of maintenance of healthy behaviours and optimum delivery approach were not discussed at all.

How critical is a broad programme focus perceived to be?

Not all study participants saw the programmes as primarily focused on weight loss and parents, children and providers saw a varied set of programme outcomes as valuable. Parents in two studies noted their interest in getting parenting support (40, 41) and others emphasised the importance of considering lifestyle more generally (2, 41), for example:

“I think the aim of something like this programme should be like I said ... a more holistic approach and not just your coming to lose weight but its to become healthier and its not just about eating less it's about everything.” Parent, (2) (p234)

Parents (1, 3, 42-44), providers (44) and children (1, 37) valued the increased self-confidence that children gained from attending. Parents mentioned other non-weight outcomes such as making friends or improved peer relationships for their children (1, 38, 39, 41, 42), improved clothing or appearance (1, 3, 42-44) and improved family relationships (41, 44). Children also mentioned other benefits of the programme such as making friends or improved peer relations (1, 37, 41, 44), increased confidence (1, 37, 44) or improved appearance (1, 37).

How is a broad programme focus perceived to motivate LWMP attendance?

In studies where participants discussed their reasons for attending, these were often not framed around weight loss, but rather were related to concerns about bullying or social isolation, which were perceived as being associated with overweight (3, 38), or children's confidence (1, 42), for example:

"I was collecting him from school and a child went past and said "bye fatty" ... I was really upset ... but he just brushed it off and said it was always happening. That was when I realised we needed to tackle this." parent (3) (p388)

Children in one study reported being more concerned about their appearance or the perception others had of them (44). Indeed in two studies there was a reluctance to participate due to the focus on overweight, with parents either not identifying their child as overweight, or not wanting them to be labelled as such (38, 39). One study reported that only a minority of parents said that their child's need for weight loss was their reason for joining the programme; instead parental weight loss was a greater concern (43).

In several studies, programme attendance was linked with children's peer relationships outside of the programme. As well as the potential for negative impacts because of norms around children's eating and physical activity (see section 2.2.5 on family involvement), participants emphasised the potential for improved relationships (1, 3, 37, 42). As one child put it, *"I'm getting good at talking to people now", child aged 11 (37) (p1221).*

A parent in one study raised concerns about self-esteem and the bullying experienced by her six year old child, and lamented the lack of attention paid to it in the programme (40). A similar desire for sessions on bullying was voiced by children in another study (1)

who said, “I think they should talk about bullying because everyone gets bullied over this.” child (1) (p139).

How is a broad programme focus perceived to motivate initiation of healthy behaviours?

Whilst participants did not link the breadth of programme focus to initiation of healthy behaviours directly, parents saw a positive impact of engaging in healthy behaviours. Parents in several studies felt that the most important outcome had been their child’s increased confidence and wellbeing rather than weight management (1, 2, 42). When considering benefits of programmes, parents and children rarely mentioned weight loss (37-39, 44) and this was not emphasised by providers. More common was an emphasis on psychosocial improvements, for example:

“There’s some success with the weight loss side of things but I think just for the children, psychologically ... They’ve got a lot more confidence and you see a big difference in them.” Provider (44) (p4)

2.2.8 Programme structure: Provider support

Box 2.2.8: Overview of findings about provider support

Overarching themes	Sub-themes
How critical is provider support perceived to be?	<ul style="list-style-type: none"> • Where discussions of providers’ characteristics emerged, they were consistently positive
In what way is provider support thought to act?	<ul style="list-style-type: none"> • <i>LWMP attendance</i>: Participants indicated that a positive and friendly approach from providers could encourage attendance • <i>Initiation of healthy behaviours</i>: Parents emphasised the value of having access to an independent third party

Provider support was discussed by participants in nine studies; children’s views were reported in five studies (1, 2, 37, 38, 44), parents’ views in eight studies (1-3, 38, 40-42, 44) and providers’ views in two studies (2, 41). These discussions touched upon its

perceived value and influence on programme attendance and initiation of healthy behaviours but not to maintenance of healthy behaviours and how provider support is best delivered.

How critical is provider support perceived to be?

As well as appreciating the role of providers in creating a non-judgemental environment within LWMPs (see section 2.2.4 on group activities), participants also separately mentioned the nature of providers themselves, but in only a small number of studies.

In one, children were described as seeming to “like the providers as well as respecting them” and children themselves described providers as “friendly” (37) (p1222). Parents also used this term in another study (1). In a third, the personal qualities of providers were described as important to families, who often stressed that they were nice people, however this did not mean that parents always saw providers as competent. As one put it:

“It felt like she was just reading.... She was a lovely lady” mother (38) (p7)

How is provider support perceived to motivate LWMP attendance?

There was little said in the studies that linked particular provider characteristics or kinds of relationship with attendance. Parents in one study referred to the positive nature of providers as a motivating factor, with one quoted as saying, *“I’ve got to say, all these young people around us and it’s great because they’re so bubbly and they’re always smiling, you don’t get anyone who’s grumpy and it does give you that boost I think.”* Mother (1).

In another study the authors state that the positive attitude and behaviour of the provider (an exercise instructor) “impacts on how the child feels while they are engaging

in activity and providers immediate feedback”. To illustrate, a child was quoted as saying, *“They’re friendly and kind, and they boost your confidence (child, 10).”* (37) (p1222)

How is provider support perceived to motivate initiation of healthy behaviours?

In terms of relationships, parents in three studies described hopes that providers could help motivate children by acting as an independent third party to motivate change (1, 40, 42). Parents in one study had sought *“someone outside the family who could ... give the child a “wake up call”* “ (49) (p178). In another they noted that the provider had a *“way of getting through to [their child] and making her realise”* (40) (p239). In a third study many parents had noted how their child would accept health messages from providers that the child would not accept if delivered by themselves, for example:

“I can’t get through to her because she thinks I’m having a go at her... where I think she’d listen to one of you because you’re not as close to her.” Mother (1)

2.2.9 Programme structure: Programme practicalities

Box 2.2.9: Overview of findings about programme practicalities

Overarching themes	Sub-themes
How critical are LWMP practicalities perceived to be?	<ul style="list-style-type: none"> Concerns were raised by parents about programme timing and venues in many studies, suggesting this is a salient issue.
How are LWMP practicalities thought to act?	<ul style="list-style-type: none"> <i>Engagement/Attendance:</i> Although raised as an issue in several studies, parental views were highly divergent with regards to optimum programme arrangements.

Parents in all ten studies and providers in all four studies discussed a range of issues relating to where and when the programmes were delivered; only one study reported children’s views on this topic (1).

How critical are LWMP practicalities perceived to be?

In two of the studies, researchers used interview prompts to ask study participants directly about the practical organisation of programmes (3, 41). In both cases these focused discussion on the suitability of programme timing and venues. Views were provided on these aspects in a further four studies where questioning was not so directive (2, 38, 39, 43, 44). Naturally, these discussions related to programme attendance rather than to initiation and maintenance of healthy behaviours.

In what ways are LWMP practicalities perceived to motivate WMP attendance?

While there is no indication that children considered practicalities to be an issue, providers in one study recognised that session timing and local transport were acting as barriers to family participation (44) and parents linked ease of participation to programme locations, session scheduling and length, and types of venue. Parents in three studies reported difficulties related travel to a programme's location (38, 39, 41). They linked these difficulties to scheduling, with authors describing reports of families *"rushing to get there after school and work ...[when] children could be tired and hungry"* (38) (p5) or difficulties with rush hour traffic, for example:

"Because it's city centre and because of the time, it was quite busy [on roads]. Yeah it was a bit hard, I mean a lot harder than I thought actually."
Parent (41) (p218)

Parents in five studies reported difficulties fitting LWMP sessions in alongside their other commitments (1, 3, 38, 39, 48). In one, the authors note that time and emotional costs were perceived as greater than costs of a financial sort, and that parents sometimes changed working patterns and shifts so as to attend (38).

Parents noted difficulties when participating children had competing out of school commitments, such as religious observance or sports (38). They also identified the challenges of meeting similar needs for siblings (1, 3). For example:

“It’s difficult to get all the things in one week. What with my other children as well, coming on a Friday night we managed, but it’s difficult you know.”

Mother (3) (p179)

The authors of one study [39] concluded that the length of its programme sessions - at two and a half-hours - was reasonably well received, but was too long to be run on a weekday after school.

No one kind of location was favoured, but comments were made by parents about the value of a venue being central for most to get to (41), being *“familiar and comfortable”* (2) (p234), local (43), or novel (3). Concerns over personal safety were also raised in one study, with some families explaining that the area where the programme was held was not safe to reach, for example because of *“gangs of kids”* (39) p14.

How are programme practicalities best arranged?

Whilst the programme timing and venue were significant issues for many parents the diversity of views inhibits identification of optimum approaches except that we might infer that a variety of options could be offered where feasible. For example, whilst some participants struggled to attend on weekends , others found weekday sessions a challenge (39, 41). In one study, parents noted that finding a time to suit everyone would be impossible (38). In two studies, parents reported taking time off work or reorganising their work times in order to attend (1, 38).

2.3 Mechanisms through which LWMP features are perceived to impact on children's and parents' engagement with LWMPs and on successful weight management

In this section we consider the overarching messages that can be drawn from the views synthesis in order to inform our analysis of trials. These mechanisms were finalised during the initial stages of the synthesis of service evaluations. The aim was to identify the features that emerged from the views synthesis as being most critical for achieving a healthy weight, in order to identify which combinations of conditions might create pathways to most or least effectiveness, which could then be analysed in the QCA.

As can be seen from the sections above (see table 2.2. for summary), the extent of views and the degree of emphasis varies for each domain; some domains are indicated as helpful whilst others are explicitly viewed as fundamental. Moreover, whilst all domains are perceived to impact on at least one element of the healthy behaviour change pathway (attendance, initiation, maintenance), some were perceived to impact on all elements.

The evidence with regard to **programme content** revealed that families value **interactive sessions** which furnish them with **practical skills and confidence**. With regard to **programme structure** the evidence indicates that two domains were implicated in all three outcomes of the self-regulatory pathway: group sessions and family involvement. Moreover, these particular domains related to **developing supportive networks** either within or outside of the family. Running throughout the findings are accounts of a home and wider social environment that either inhibits or supports healthy behaviour change. In sum, families indicated that successful LWMPs need to simultaneously furnish them with the skills, confidence and resilience to support healthy behaviour change and to resist undermining influences (see figure 2.3).

Programme content: Practical experiences that show you how to change rather than what to change

“It wasn’t just like ‘you need to do more exercise and you need to eat better’ – it actually taught us like how to” child (1) p181

A theme that ran through all three domains of programme content (physical activity, healthy eating and behaviour change) was that practical approaches were valued. These practical approaches ensured that the programme showed children and families *how to change*, rather than simply telling them *what* they should change. Participants were explicit that didactic information giving was not valued and that interactive sessions were more engaging. Most widely and emphatically valued were sessions in which children, and in some cases parents, engaged in physical activities; these sessions demonstrated to children that they were able to do it, giving them confidence in their abilities, as well as enabling them to experience enjoyment from being active. Practical and interactive healthy eating sessions were also highly valued. Examples included cooking and tasting sessions, and the use of visual approaches for conveying information, for example around portion sizes or sugar content. Likewise, practical strategies to support behaviour change, such as goals or monitoring, or parenting skills, were also felt to be helpful.

Programme structure: social support: a safe space with similar others in which to gain confidence and skills

“just talking to the other parents, finding out you weren’t alone in this [...] having an open forum to say my kid does that too, cause you feel so guilty and it’s not about guilt it’s about learning” Parent (3) p177

Families were emphatic about the benefits of group sessions in terms of enabling them to support each other’s behaviour change and indicated that it provided a positive

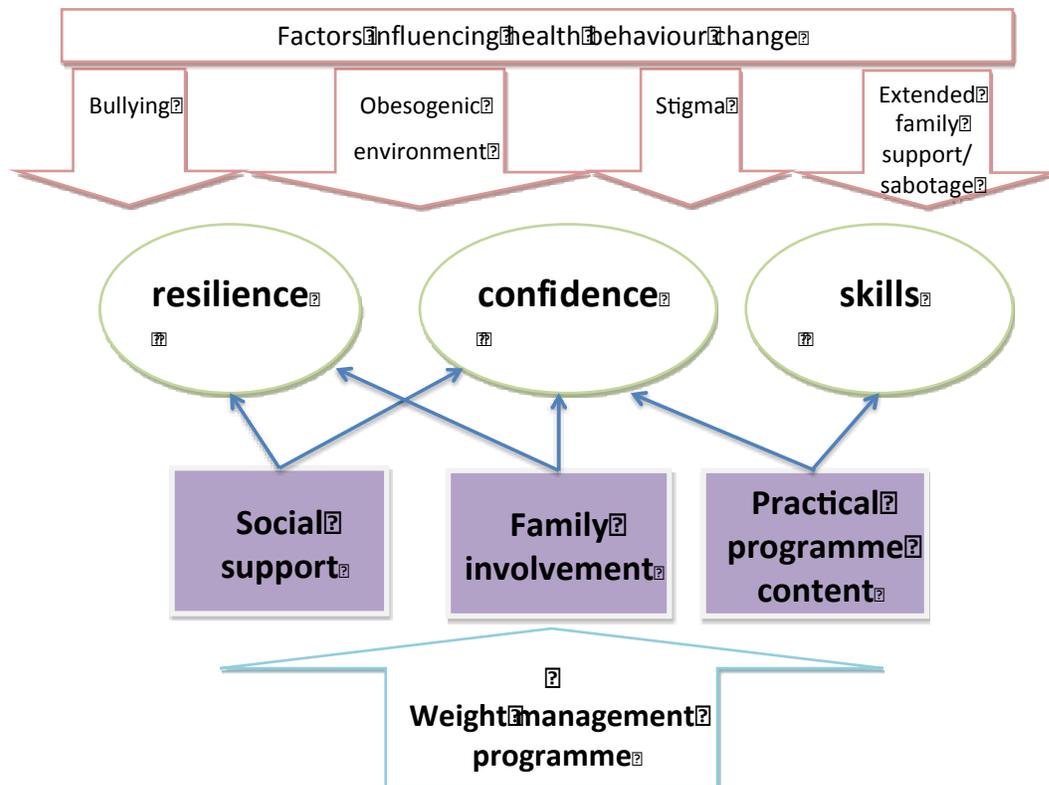
contrast to their experiences of prejudice and bullying. Children, parents and providers all provided evidence indicating the positive impacts of group sessions on children’s confidence, which in turn was described as fundamental to both initiation and maintenance of health behaviour changes.

Programme structure: family involvement - creating shared understanding and a healthy home environment

“They’ve got to have the support of the others in the family otherwise it’s almost impossible” (2) p238

As the quote above implies, the second area in which the notion of resilience was raised was within the family itself. As discussed in section 2.2.5, having the whole family on-board was deemed to enable a shared understanding across family members, a shared responsibility for making changes and ultimately the creation of a healthy home environment. Conversely, one of the key impediments to change was felt to be other family members both within the home and in relation to extended family and friends.

Figure 2.3: Overarching preconditions necessary for change



3. Synthesis of service evaluations: Do the views of service users and providers help us to understand pathways to successful weight management via LWMPs?

This chapter reports on the synthesis of service evaluations, in which we used the findings from the views synthesis to examine the nature of LWMPs evaluated in trials. With this synthesis we aimed to test whether features *perceived* to be important are actually *associated with improved BMIz outcomes*. Section 3.1 describes the trials included and the context in which they evaluated LWMP interventions; Section 3.2 reports our findings about pathways to improved weight management.

3.1 What evidence was examined in the synthesis of service evaluations?

3.1.1 Summary of evidence examined in the synthesis of service evaluations:

- From previous reviews and an updated search we identified 24 eligible trials of **30 LWMP interventions** of which 20 were included in our analyses.
- We compared five interventions which achieved clinically significant results (a mean difference between intervention and control in the change in BMIz from baseline to 12 months that was at least -0.25) and were thus classified as **'most effective'** for improving BMIz with 15 interventions which were classified as **'least effective'** (a mean difference of -0.05 or less).
- All LWMPs were delivered to children who were overweight or obese with a **mean age of 11 years or younger**.
- 9 LWMPs were evaluated in the **USA**, 7 were evaluated in **European countries** (of which 3 were in **the UK**) and 4 were evaluated in **Australasia**.

3.1.2 The context of the interventions and the trials from which they were drawn

Studies to be screened for inclusion in this review were identified from existing reviews (18, 19, 29, 33), from an ongoing Cochrane review of LWMPs for primary school-aged children (53), and by updating the search for one review (19). Studies needed to meet the following predetermined eligibility criteria: randomised controlled trials evaluating the impact on BMI_z at 12 months⁶ of LWMPs for overweight or obese children aged ≤ 11 years in comparison to a control group which received minimal intervention such as a wait-list control, usual care, information only or a minimal contact intervention (for more detail on how we identified studies for inclusion, see section 6).

From existing systematic reviews and updated search we included 30 intervention evaluations reported in 24 trials (54-77). Several trials evaluated multiple interventions (they had more than two intervention arms); two interventions were included from each of six trials (54, 56, 63, 65, 69, 70).

The mean reduction in BMI_z, countries and participants of each intervention are described in Table 3.1.2. A more detailed summary of the trials and interventions is provided in Appendix 2.

To select studies for inclusion in the analysis, we took all of the identified trials and ranked them in terms of the size of the mean difference in BMI_z seen between the trial's intervention and control arms at 12 months. These were then classified as 'most effective', 'least effective', or as 'moderately effective' interventions. For an intervention to be classified as 'most effective' its trial needed to show a mean difference between intervention and control in the change in BMI_z from baseline to 12 months that was at least -0.25 (this is the minimum reduction that has been found to be

⁶ Timing of outcome varied from 10.5 months post-baseline in one study [54] to 15 months on another [55] and 24 months in two others [56, 57]; many offered no specific detail beyond '12 month follow-up'.

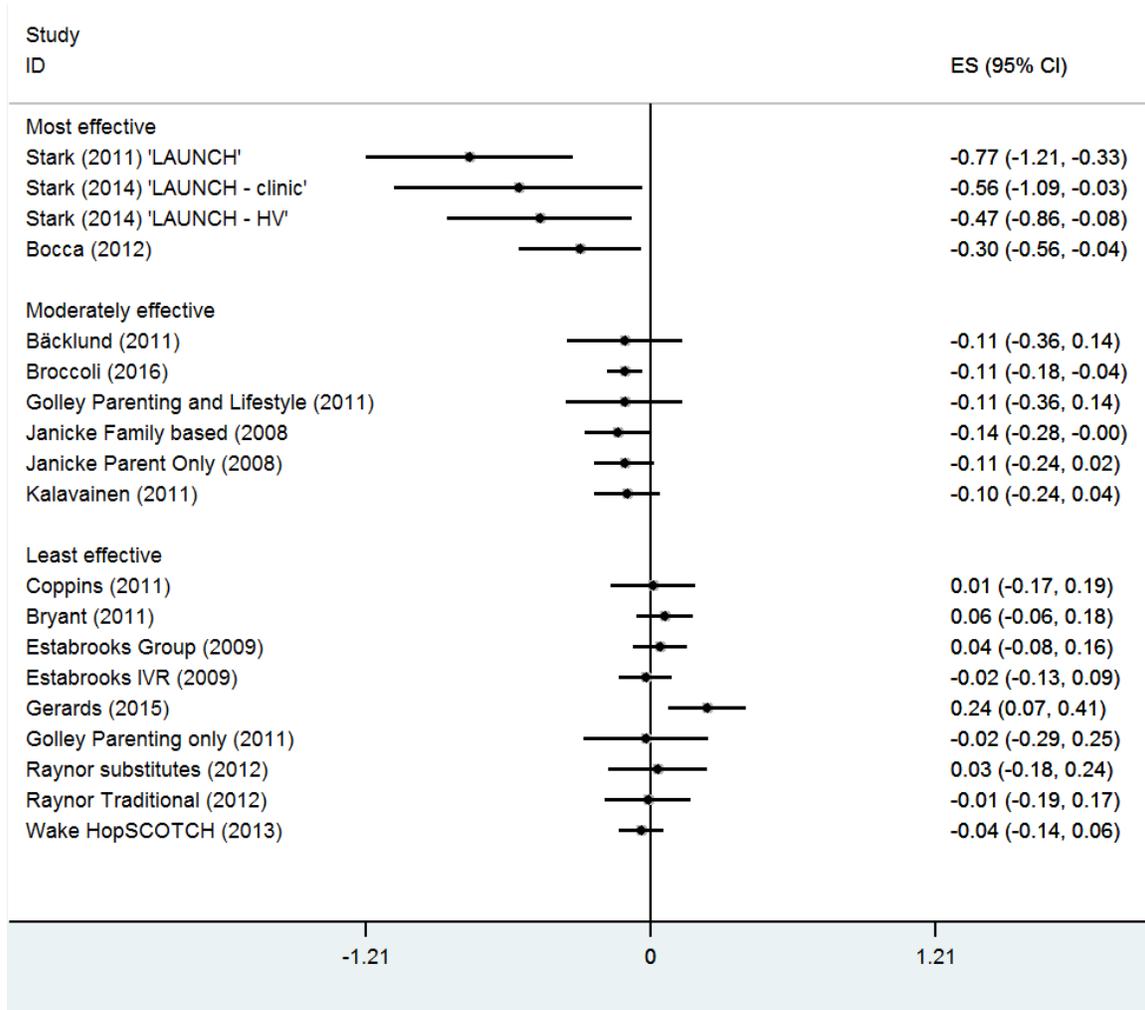
associated with improvements in health risk factors in adolescents; there remains a lack of evidence for younger children) (78). Those with a mean difference of -0.05 or less were categorised as 'least effective'. See section 6.5.4 for more detail about the classification criteria.

Five intervention were classified as 'most effective' and 15 as 'least effective'. These interventions were included in the qualitative comparative analysis (QCA). The remaining ten 'moderately effective' interventions were not included in the QCA in order to filter out the 'noise' which might obscure differences between the most effective and least effective interventions. However we briefly consider how the findings from the QCA fit with the moderately effective interventions in section 3.2.2.

In general, study quality was not high, with no studies considered at low risk of bias for every criterion used (see appendix 7.3). However there was no substantial difference in quality between the most effective and least effective sets of interventions. There were however, a few notable contextual differences between the two sets. Four of the five most effective intervention arms targeted pre-school children compared to only one of the least effective intervention arms. None of the most effective set had a large sample size (i.e. at least 50 subjects in each arm), compared to nine of the least effective. The mean BMIz at baseline in the most effective set was 2.4 for the intervention arms and 2.5 for the control arms (not stated for (71)). In the least effective set it was 2.2 for both intervention and control arms.

A forest plot was produced to visually present the difference in BMIz change between the intervention group and the control group at 12 months follow up (figure 2.1.2). However, several trials (55-57, 66, 68, 72-75, 77) did not provide data on the variance for change in each group and so we were unable to represent them in the forest plot. Details of the outcomes for all trials, including these, can be found in table 3.1.2.

Figure 3.1.2: Difference in change in BMIz between groups at 12 months follow up*



*Several interventions (n=11) were unable to be presented in this forest plot since the information to calculate confidence intervals was unavailable. However, outcomes for all of the studies (without confidence interval data) are available in Table 3.1.2 below.

Table 3.1.2: Overview of trial and intervention contexts and outcomes (n=30 trials)

	Refer ence	First study author and year (intervention arm)	BMIZ difference*	BMIZ reference population used	Country of study	Total number participants**	Age & BMI eligibility criteria
Most effective interventions	(71)	Stark 2011	-0.77	USA 2000	USA	18	2-5 years, BMI 95-99th
	(77)	Weigel 2008	-0.60	Germany 2001	Germany	73	7-15 years, BMI >90th
	(70)	Stark 2014 (LAUNCH-clinic)	-0.56	USA 2000	USA	23	2-5 years, 95-99th
	(70)	Stark 2014 (LAUNCH – HV)	-0.47	USA 2000	USA	22	2-5 years, 95-99 th
	(59)	Bocca 2012	-0.30	The Netherlands 1996/7	The Netherlands	75	3-5 years, BMI-z >1.1
Moderately effective interventions	(56)	Resnicow 2015 (provider plus RD)	-0.18	USA 2011***	USA	447	2-8 years, BMI 85-97th
	(56)	Resnicow 2015 (provider- only)	-0.14	USA 2011***	USA	410	2-8 years, BMI 85-97th
	(54)	Janicke 2008 (family-based)	-0.14	n/s	USA	59	8-14 years, BMI >85th
	(54)	Janicke 2008 (parent-only)	-0.11	n/s	USA	60	8-14 years, BMI >85th
	(60)	Broccoli 2016	-0.11	n/s	Italy	372	4-7 years, BMI 85-94 th
	(58)	Backlund 2011	-0.11	Sweden 2000	Sweden	105	8-12 years, age- and gender- adjusted BMI of $\geq 25\text{kg/m}^2$
	(65)	Golley 2007 (Triple P + lifestyle education)	-0.11	UK 1990	Australia	74	6-9 years, overweight or obese according to IOTF but BMIZ ≤ 3.5
	(74)	Taylor 2015	-0.11	USA 2000	New Zealand	206	4-8 years, BMI $\geq 85\text{th}$
	(67)	Kalavainen 2011	-0.10	UK 1996	Finland	70	7-9 years, weight for height 120- 200%
(68)	Lochrie 2013	-0.10	n/s	USA	150	8-11 years, with BMI $\geq 85\text{th}$	

	Reference	First study author and year (intervention arm)	BMIZ difference*	BMIZ reference population used	Country of study	Total number participants*	Age & BMI eligibility criteria
Least effective interventions	(73)	Taveras 2011	-0.05	n/s	USA	475	2-6.9 years, BMI \geq 95th percentile or BMI 85 th to 95th if \geq 1 parent BMI \geq 25
	(72)	Taveras 2015	-0.05	USA 2000	USA	355	6-12 years, BMI \geq 90 th
	(76)	Wake 2013	-0.05	n/s	Australia	118	3-10 years, BMI $>$ 95 th
	(57)	Van Grieken 2014	-0.04	n/s	The Netherlands	637	5 years; overweight but not obese
	(66)	Hughes 2008	-0.04	UK 1990	UK	134	5-11 years, BMI \geq 98 th
	(63)	Estabrooks 2009 (FC-IVR)	-0.02	USA 2000	USA	135	8-12 years, BMI $>$ 85 th
	(65)	Golley 2007 (parenting only)	-0.02	UK 1990	Australia	73	6-9 years, overweight or obese according to IOTF but BMIZ \leq 3.5
	(55)	McCallum 2006	-0.02	UK 1990	Australia	163	5-9 years, classified as overweight/mildly obese according to IOTF
	(69)	Raynor 2012 (traditional)	-0.01	USA 2000	USA	55	4-9 years, BMI \geq 85 th
	(62)	Coppins 2011	-0.01	UK 1990	UK	65	6-14 years, BMI $>$ 91 st centile
	(75)	Wake 2009	0.02	USA 2000	Australia	139	5-9 years overweight/mildly obese according to IOTF but BMIZ \leq 3.0
	(69)	Raynor 2012 (substitutes)	0.03	USA 2000	USA	55	4-9 years, BMI \geq 85 th
	(63)	Estabrooks 2009 (FC-group)	0.04	USA 2000	USA	135	8-12 years; BMI $>$ 85 th
	(61)	Bryant 2011	0.06	UK 1990	UK	70	8-16 years; BMI $>$ 98 th
	(64)	Gerards 2015	0.24	The Netherlands 1996/7	The Netherlands	86	4-8 years, overweight or obese

* Mean difference in the change in BMIZ at 12 months between intervention and control group

** Number of participants in focal intervention and control

*** BMIZ calculated by study team based on BMI percentile. BMI percentile calculated using CDC BMI percentile calculator 2011

3.2 Findings: synthesis of service evaluations

Section 3.2.1 reports findings about **individual** features or '**conditions**' within interventions. Section 3.2.2 reports our **qualitative comparative analysis (QCA)** to explore whether **combinations or 'configurations' of conditions** matching the findings of the views synthesis can explain pathways to greater effectiveness.

3.2.1 Findings about individual conditions

We examined the conditions in each of the 20 interventions using a coding framework developed from the views synthesis (See appendix 6). The framework enabled us to explore the presence or absence of conditions within the key domains identified in the views synthesis; physical activity sessions, healthy eating sessions, health behaviour change strategies, group delivery, family involvement, programme breadth, ongoing support, provider support and programme practicalities. We also captured additional information on the interventions such as provider characteristics and intervention intensity, and on contextual factors that could moderate outcomes such as participants' baseline weight or trial recruitment methods. The results of this coding were recorded in a 'data table' enabling us to display differences between most effective and least effective interventions for each condition. Appendix 6 contains a data table with findings on a wide range of conditions; below we describe where distinct differences between most and least effective interventions were apparent and Table 3.2.1 provides an overview.

Limitations of findings about individual conditions

Whilst **the findings on individual conditions provide some interesting insights**, we urge caution in interpretation due to the small number of studies in the most effective set and the lack of understanding it brings about how conditions interact with each other (i.e. through combinations of conditions). **Stronger conclusions can be drawn from the**

QCA (presented in section 3.2.2 below) because it is underpinned by the overarching

findings of the views synthesis and because it takes into account the complexity of interacting components.

Which conditions appear to be associated with clinically significant outcomes?

Conditions present in all of the most effective interventions and absent in all least effective interventions

One condition, **advice on calorie intake**, was found to discriminate perfectly between most effective and least effective interventions; all five of the most effective interventions were described as including advice on calorie intake but none of the 15 least effective interventions were.

*Conditions present in all of the **most** effective interventions and absent in the **majority** of least effective interventions.*

Five conditions were present in all of the most effective interventions (n=5) but absent in the majority of least effective interventions (n=≥11):- **group physical activity sessions for children**; provision of **more than two group sessions for parents**; attempts to ensure **programmes were accessible to or engaged children** (such as child-only sessions or child-friendly activities); provision of **more than two sessions on practical health behaviour change strategies** (for example stimulus control, coping strategies, goal setting, rewards, self-monitoring and/or role modelling) and having the **intervention delivered by a psychologist**. In contrast to the other conditions in this category, the views synthesis provided no evidence to explain the finding about psychologist delivery.

Notably, the authors of one of the two least effective interventions with physical activity sessions (61) reported that such sessions were compromised in this study⁷ and in the other the authors noted that attendance at the physical activity sessions was poor (62).

*Conditions which were present in the **majority** of most effective interventions and absent in the **majority** of the least effective interventions.*

Four conditions were present in the majority ($n \geq 3$) of the most effective interventions but absent in most of the least effective interventions ($n \leq 11$) and most of them corresponded with the views synthesis findings:- **high intensity interventions**, defined here as interventions which a) last for six months or longer b) comprise of 10 sessions or more and c) deliver sessions at fortnightly or more frequent intervals; **group sessions for children** that were not physical activity sessions (i.e. discussion or education sessions); **tasting activities** and lastly, a finding for which there is no explanation offered by the views synthesis, **programmes which exclusively target pre-school children.**

Which conditions appear to be associated with low effectiveness?

Five conditions were present in many ($n \geq 6$) of the least effective interventions but absent in *all* of the most effective interventions ($n=5$), only one of which, **delivery to parents only** (without child involvement in the LWMP), was explained by the views synthesis (see section 2.2.5). The other four conditions included **intervention-specific training for programme providers**, a **large sample in the trial** (defined here as being 50 or more participants per arm), an approach to goal setting in which **parents and/or children select or negotiate behavioural goals** and **narrowly-focused dietary advice.**

⁷ The authors note the intervention providers' view that the imposition of trial conditions meant that sessions ran at a reduced capacity which they perceived to lead to a reduction in motivation levels of children in group physical activity sessions when compared to implementation of this programme prior to the trial.

However, many of the conditions examined showed no clear difference between the most and least effective interventions and there was insufficient evidence to identify any patterns for some of the issues raised in the views synthesis such as having a broader programme focus or on-going support. See appendix 6 for details.

Of course there are multiple possible explanations for these findings and the QCA in section 3.2.2 explores the findings in light of other conditions and the views synthesis, such that we can begin to understand the mechanisms at play.

Table 3.2.1: Overview of conditions which distinguish between ‘most effective’ and ‘least effective’ interventions

Condition	Most effective (n=5)	Least effective (n=15)
Conditions present in all most effective interventions and absent in all least effective interventions		
Advice on calorie intake	5	0
Conditions present in all most effective interventions but absent in the majority of least effective interventions (n ≥11)		
Delivered by psychologist	5	1
Group physical activity sessions for children	5	2
Group sessions (any type) for children	5	2
More than 2 group discussion/education sessions for parents	5	4
Intervention designed to engage children	5	4
More than 2 sessions on practical health behaviour change strategies	5	4
Conditions present in the majority of most effective interventions (n ≥3) but absent in the majority of the least effective interventions (n ≥11)		
High intensity (6+ months, 10+ sessions delivered at least fortnightly)	4	1
Group discussion/education sessions for children (i.e. not physical activity)	4	1
Exclusively focused on pre-school children (5yrs and under)	4	1
Delivered food tasting activities	3	1
Conditions present in many least effective interventions (n ≤6) but absent in all of the most effective interventions		
Providers given intervention-specific training	0	9
50+ participants per arm	0	9
Behavioural goals set in negotiation with parents	0	8
Child does not attend (only parent)	0	7
Narrow dietary advice	0	6

3.2.2 Findings from the qualitative comparative analysis

In this section we focus on particular **combinations of conditions**, referred to in qualitative comparative analysis (QCA) as ‘configurations’. Drawing on the views synthesis we examined configurations of conditions implicated in the two overarching preconditions necessary for change (see section 2.3); a) programme content which engages families and furnishes them with the **necessary skills and confidence** to make changes and b) programme structures which foster supportive networks, both within and outside of the family, that **enable resilience** to the contextual factors that undermine efforts to be healthy. We have developed **three models**, each incorporating related features that form part of a broader mechanism. One model reflects conditions anticipated to engage families and provide them with the **skills and confidence** necessary for behaviour change, the second involves a configuration of conditions anticipated to foster social **support within the family**, the third model involves conditions anticipated to foster social **support from peers** in the LWMP (see appendix 6 for full data set).

Whilst we can only draw **tentative conclusions about pathways to high effectiveness** due to the small number of most effective interventions and other factors such as the size of the trials evaluating them, the **findings about pathways to least effectiveness are stronger** as they are based on a larger set of studies. However, for each model we present the weaker evidence on pathways to high effectiveness before considering pathways to least effectiveness as the models are easier to interpret this way.

“It actually taught us like how to”: Model 1: How to change

The first model was intended to address *how* to deliver the three key elements of programme content in a lifestyle weight management programme, healthy eating, physical activity and behaviour change. Two conditions reflect key themes from the

views synthesis around practical support and guidance with regards to physical activity and behaviour change. The first condition is **physical activity sessions provided to children** within the LWMP since the views synthesis revealed that children, parents and providers were emphatic about the benefits of such sessions in encouraging them to be more active. The second condition reflects the views synthesis theme around the need for **practical support for changing behaviour**, such as parenting skills and behaviour change strategies (e.g. use of goals and monitoring). For this condition to be met, more than two of these sessions needed to have been delivered. The final condition, regarding diet, was the need for **advice from providers with regard to calorie intake** (e.g. ‘a normocaloric diet was advised based on the required daily intake for this age group’ (59)). This condition emerged primarily from our assessment of the intervention descriptions for each study rather than from the views synthesis. Whilst the importance of this component was not underscored by the views of children, parents and providers, evidence from our previous review on adult weight management had identified calorie goals as a critical feature of LWMPs (79). We identified interventions representing a total of four of a possible eight configurations in this model (2 x 2 x 2 conditions); each of the four configurations is presented in Table 3.2.2a, together with the number of interventions.

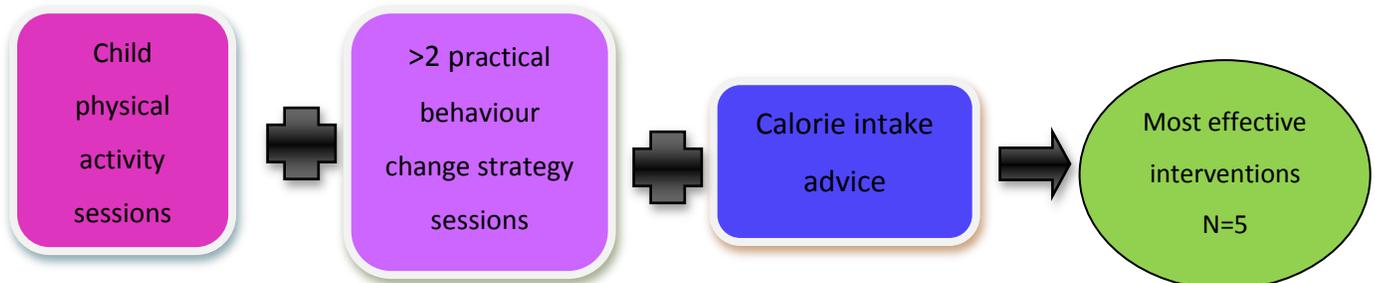
Table 3.2.2a: Configurations represented in the ‘how to change’ model

Child physical activity sessions	>2 practical behaviour change strategy sessions	Calorie intake advice	Number of the most effective interventions	Number of the least effective interventions
Absent	Absent	Absent	0	9
Absent	Present	Absent	0	4
Present	Absent	Absent	0	2
Present	Present	Present	5	0

None of the four configurations included either a mix of both most effective interventions and least effective interventions (i.e. none were contradictory) (see Table 3.2.2a). We judged that the configurations in this model (or ‘truth table’) had good spread across the included interventions. However, there were four configurations of conditions for which we did not have any interventions in our dataset (‘logical remainders’), these are discussed later.

Based on Table 3.2.2a we identified the simplest possible expression of configurations (see section 6 for details). This identified one possible pathway to high effectiveness (illustrated in Figure 3.2.2a). This pathway was characterised by the presence of each of the three conditions; there were no least effective interventions with this configuration (i.e. it was completely consistent) and it represented all five most effective interventions (i.e. it had complete coverage).

Figure 3.2.2a: Pathway to most effectiveness via ‘how to change’ model



Our analysis for least effectiveness identified no most effective interventions with this configuration (i.e. it was completely consistent) and covered all of the least effective interventions (i.e. it had complete coverage); it revealed two pathways to least effectiveness (see figure 3.2.2b). One pathway was characterised by the absence of both group physical activity sessions for children and the absence of advice about calorie intake. The second pathway was characterised by the absence of both more than two practical behaviour change strategies and advice on calorie intake. Whilst nine least effective interventions were characterised by the absence of all three conditions in the

model, the evidence suggests that the absence of calorie intake advice coupled with the absence of either one other conditions is sufficient to lead to reduced effectiveness.

Figure 3.2.2b: Pathway to least effectiveness via ‘how to change’ model

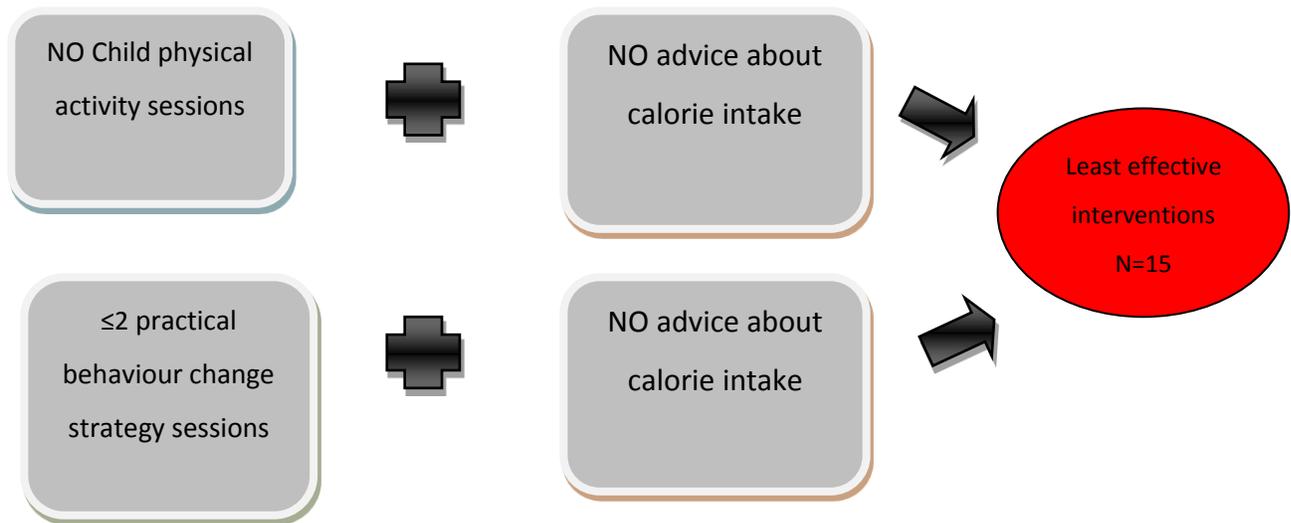


Table 3.2.2b: Configurations of conditions for which we did not have any interventions in our dataset for the ‘how to change’ model (i.e. logical remainders)

Child physical activity sessions	>2 practical behaviour change strategy sessions	Calorie intake advice
Absent	Present	Present
Absent	Absent	Present
Present	Absent	Present
Present	Present	Absent

As Table 3.2.2b illustrates, we identified four possible configurations in the how to change model that were not present in any of the included interventions. We concluded that all of these logical remainders would probably lead to lower effectiveness, since the presence of all conditions appears to be necessary for higher effectiveness.

***“They’ve got to have the support of the others in the family otherwise it’s almost impossible”*: Model 2: Getting all the family on board**

This model comprised of three conditions. The first reflects the use of approaches to ensure that sessions involving children (either those given separately to children or those also involving adults) are designed to be child-friendly. In essence this condition reflects the **need to engage children** in the LWMP. The second condition represents the need for the programme to **aim to change behaviours across the whole family**, as opposed to only targeting the behaviour change of the participating child. This condition reflects the findings of the views synthesis that in addition to a shared understanding, shared healthy practices and a healthy home environment support implementation and maintenance of behaviour change. The third condition addresses the need for a sufficient number of **child and parent discussion/education sessions** (defined as more than two sessions for each participant, either separate adult and child sessions or joint sessions) such that there could be a shared understanding across different family members of the programme aims and strategies. The need for group discussion sessions was identified in the views synthesis; in the analysis of service evaluations we noted that some LWMPs included only one or two group sessions. It emerged from the views synthesis that the value of these group sessions lay in the social support and social learning that they offered. We hypothesised that it would be challenging to benefit from social support if only a few sessions were offered, therefore we added this numerical cut-off to the condition. We identified interventions representing seven of a total of eight possible configurations in this model (2 x 2 x 2 conditions); each of the seven configurations is presented in Table 3.2.2c, together with the number of interventions.

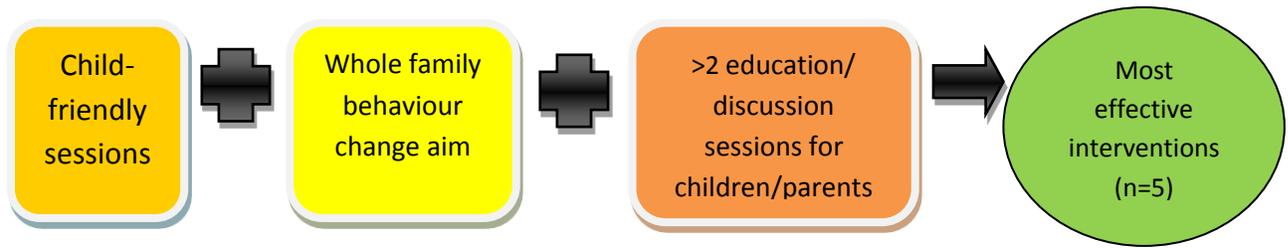
Table 3.2.2c: Configurations represented in the ‘getting all family ‘on board’’ model

Child-friendly sessions	Aim to change behaviour of whole family	>2 education/discussion sessions for children and parents	Number of the most effective interventions	Number of the least effective interventions
Absent	Absent	Absent	0	1
Absent	Present	Absent	0	5
Absent	Present	Present	0	5
Present	Absent	Absent	0	1
Present	Absent	Present	0	2
Present	Present	Absent	0	1
Present	Present	Present	5	0

None of the seven configurations represented by the included interventions included both most effective interventions and least effective interventions (i.e. none were contradictory) (see Table 3.2.2c). We judged that the configurations in this model (or ‘truth table’) had good spread across the included interventions. Configurations of conditions for which we did not have any studies in our dataset (‘logical remainders’ - one in this case) are discussed later.

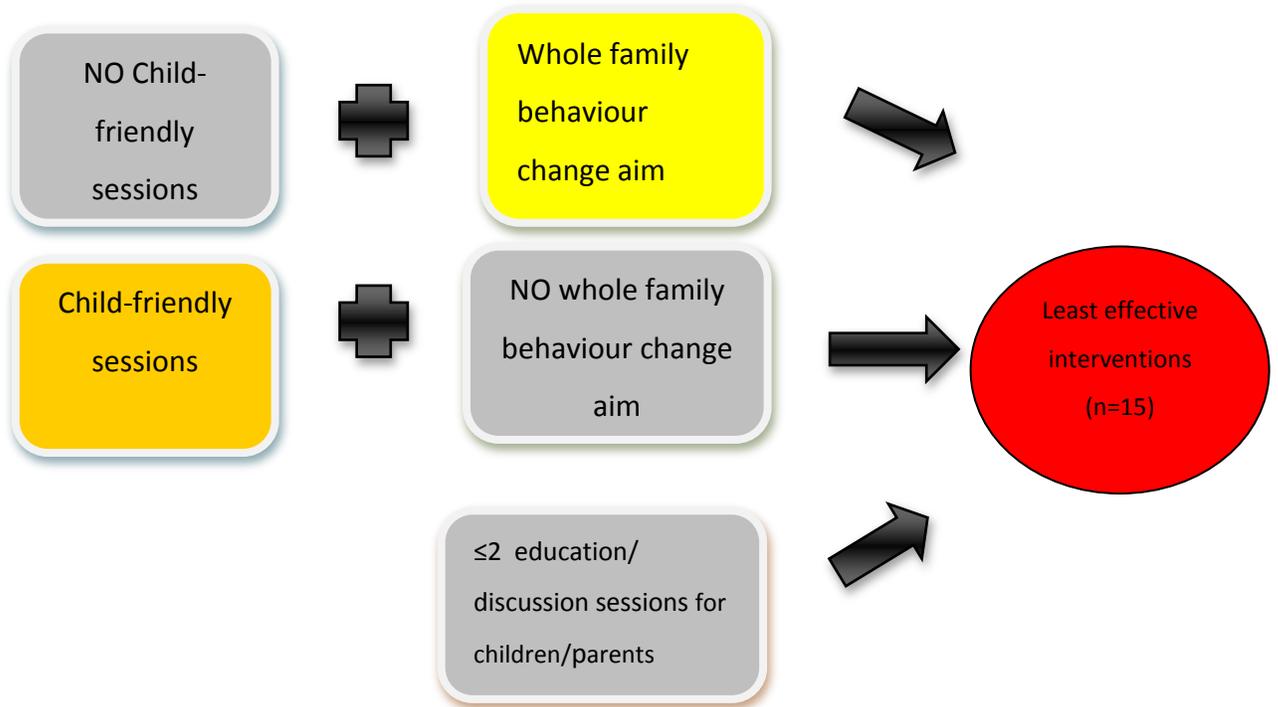
We identified one possible pathway to high effectiveness (illustrated in Figure 3.2.2c). This pathway was characterised by the presence of all three conditions. There were no least effective studies with this configuration (i.e. this pathway was completely consistent and it represented all five most effective interventions (i.e. it had complete coverage).

Figure 3.2.2c: Pathway to most effectiveness via getting all the family 'on-board'



Our analysis for least effectiveness found no most effective interventions with this configuration (i.e. it was completely consistent) and it covered all of the least effective interventions (i.e. it had complete coverage). It revealed three pathways to intervention least effectiveness. One pathway, which accounted for eight of the least effective interventions, revealed that interventions which do not involve more than two sessions for both children and parents had reduced effectiveness, regardless of whether either or both of the other two conditions in this model were present. A second pathway was characterised by the lack of child friendly sessions but the presence of an aim to change the behaviour of the whole family. The third pathway was characterised by the presence of child friendly sessions but by a lack of an aim to change the whole families' behaviour. In sum, as can be seen from Figure 3.2.2d below, the absence of any one of the three conditions in the model was found to result in least effectiveness.

Figure 3.2.2d: Pathway to least effectiveness via not getting all the family ‘on-board’



The findings thus suggest that the lack of a comprehensive family-based approach, i.e. one which aims to engage both children and parents *and* which aims to achieve whole-family behaviour change, is likely to result in reduced effectiveness. We therefore conclude that the one, configuration for which we found no corresponding interventions for this model (‘logical remainder’), would also likely result in reduced effectiveness. This configuration is characterised by the presence of three or more sessions for both children and parents, but by a lack of child friendly sessions and by a lack of an aim to change the whole families’ behaviour.

“Finding out you weren’t alone in this”: Model 3: Social support

One of the key themes emerging from the views synthesis was the crucial role of social support from similar others, both for parents and children. Social support fostered motivation to attend lifestyle weight management programmes, increased confidence and self-esteem which in turn supported families’ adoption of healthier behaviours. As such this model comprised of two conditions; one reflecting the need for **group sessions for children only** and one reflecting the need for **more than two group sessions for adults** only⁸, such that all parties had the opportunity to benefit from social support from similar others. We identified interventions representing each of a total of four possible configurations in this model (2 x 2 conditions); each of the four configurations is presented in Table 3.2.2d, together with the number of interventions.

Table 3.2.2d: Configurations represented in the ‘social support’ model

Child group sessions	>2 parent group sessions	Number of the most effective interventions	Number of the least effective interventions
Absent	Absent	0	9
Absent	Present	0	4
Present	Absent	0	2
Present	Present	5	0

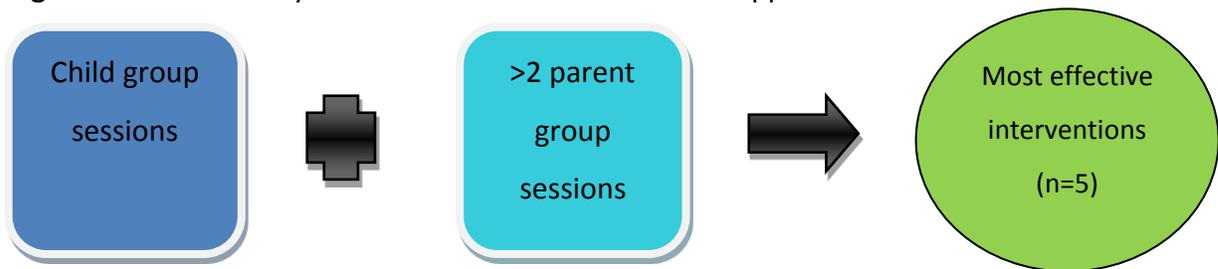
None of the four configurations included both most effective interventions and least effective interventions (i.e. none were contradictory) (see Table 3.2.2d). We judged that the configurations in this model (or ‘truth table’) had good spread across the included

⁸ For this condition, the data available allowed us to identify a minimum ‘cut-off’, i.e. more than two sessions, rather than simply whether sessions were present or absent. Such specificity was not possible for all conditions due to limitations in the variation in the dataset.

interventions. There were no configurations of conditions for which we did not have any interventions in our dataset ('logical remainders').

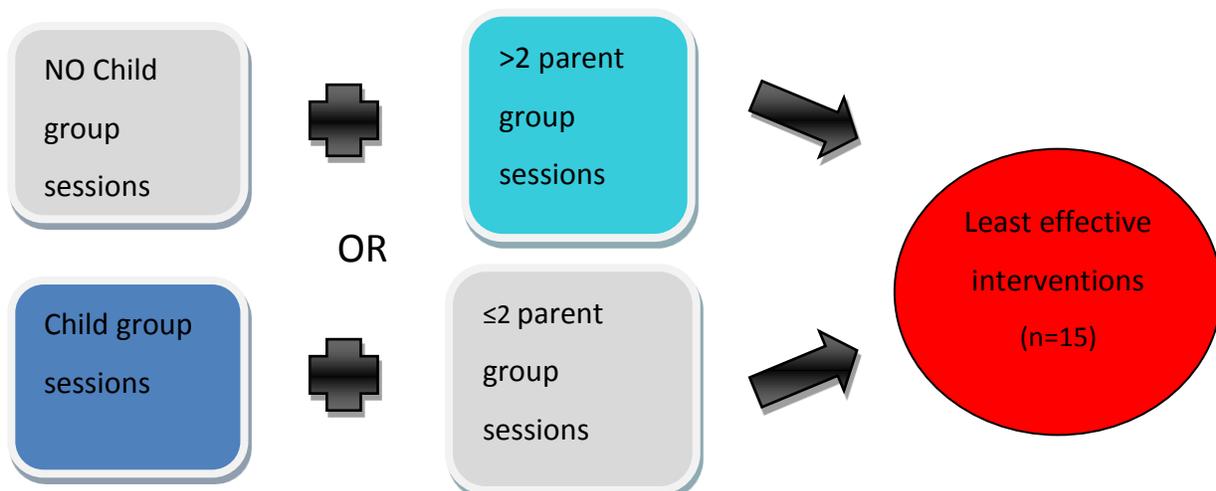
Based on Table 3.2.2d we identified the simplest possible expression of configurations (see section 6 for details). This identified one possible pathway to high effectiveness (illustrated in Figure 3.2.2e). This pathway was characterised by the presence of both conditions; it was completely consistent and had complete coverage.

Figure 3.2.2e: Pathway to most effectiveness via social support



Our analysis for least effectiveness was completely consistent and covered all of the least effective interventions. It revealed two pathways to least effectiveness (see figure 3.2.2f). Essentially, the absence of group sessions for either parents or children was associated with least effectiveness. Whilst two least effective interventions were characterised by the absence of parent group sessions and four least effective interventions were characterised by the absence of child group sessions, most of the least effective interventions (n=9) were characterised by the lack of both of these conditions.

Figure 3.2.2f: Pathway to least effectiveness via lack of social support



In summary, the findings suggest that the absence of opportunities for both children and parents to benefit from social support via a LWMP will result in reduced effectiveness.

Findings with regards to the moderately effective studies (n=10)

Once the QCA had been conducted and the combinations of conditions identified that were associated with the most and the least effective interventions, the mid-effect interventions (i.e. those achieving ≤ 0.25 change in BMIz compared to controls but greater than -0.05 change) were then assessed according to these criteria. This was to identify whether any interventions should, according to the QCA findings, be in either the most or the least effective set. This added a further layer of robustness to the findings by further testing the validity of our analysis, as well as potentially highlighting additional conditions that may be of relevance that had not previously been considered. We hypothesised that moderately effective interventions would likely be characterised by some but not all of the pathways to effectiveness for the above models.

As expected, we found that none of the ten moderately effective trials were characterised by pathways to effectiveness for all three models. Five interventions were characterised by pathways to most effectiveness with regards to the all family on-board and the social support models, but by pathways to least effectiveness with regards to the 'how to change' model (Backlund, Golley, Janicke family-based, Kalavainen, Lochrie). The remaining five were characterised by pathways to least effectiveness with regard to all three models (Broccoli, Janicke parent-only, Resnicow provider-only, Resnicow provider+RD and Taylor). Details are provided in Appendix 6, table 6.7.3.

4. Case studies: How do the reviews findings resonate with local authority experiences?

In the final stage of the review we conducted case studies in two Local Authorities (LAs). The aim was to draw out the implications of our review findings for LA commissioning and the provision of Tier 2 lifestyle weight management services for children in the UK. The work involved open-ended interviews with key LA staff covering:

- a) the nature of the LWMPs they currently provide.
- b) the particular benefits and challenges of providing LWMPs.
- c) how current provision is monitored and evaluated.
- d) how the LA's provision and experiences resonate with the review findings.
- e) how to present and disseminate the findings of the review for LAs in the UK.

As described in Section 6.6.1, the two LAs, North Yorkshire and Rotherham, were selected to reflect differences in their characteristics and variation in weight management strategy. In particular, because the synthesis of service evaluations found group delivery was significant, we selected authorities with contrasting delivery approaches; Rotherham provides group-based services and North Yorkshire has recently moved to a model involving delivery to individual families within the home or in community settings close to home, due to the challenges of delivering group-based services in rural areas. Table 4 presents key aspects of the services currently provided.

Table 4: Overview of local authority Tier 2 lifestyle weight management service provision

	Case study LAs' details of current provision and plans	
	North Yorkshire	Rotherham
Participants	<ul style="list-style-type: none"> Commissioner: Health Improvement Manager Provider: LWMP services manager 	<ul style="list-style-type: none"> Commissioner: Public Health Specialist, Rotherham Council
Council type ¹	<ul style="list-style-type: none"> County Council Largely rural population of around 603,000 	<ul style="list-style-type: none"> Metropolitan Borough Council Urban population of around 259,000
Population characteristics ¹	<ul style="list-style-type: none"> Less than 5% living in 20% most deprived areas in England 92% white British In Year 6, 15.7% (835) of children are classified as obese. 	<ul style="list-style-type: none"> 33% living in 20% most deprived areas in England 92% white British² In Year 6, 23.4% (671) of children are classified as obese.
Commissioning cycle stage	<ul style="list-style-type: none"> New programme of provision commenced in October 2015 	<ul style="list-style-type: none"> Programme in place since 2009, but re-commissioned in April 2015.
Service management model	<ul style="list-style-type: none"> Moved to in-house model LWMP service is part of a multi-strand integrated service, alongside: <ul style="list-style-type: none"> - a universal Healthy Child Service delivered by school nurses - targeted prevention for children considered at higher risk of poor health outcomes more generally - a support and advice service for young people aged from 9 to 19 affected by substance misuse, poor sexual health and issues relating to emotional wellbeing and mental health - and a residential lifestyle weight management programme that takes referrals only from the other strands. 	<ul style="list-style-type: none"> Contractor manages recruitment and triage through a single point of access for all weight management services The contractor is a provider of leisure centres in Rotherham and other LAs Web-based data management system enables streamlined referral, case management, service monitoring and evaluation
Referral	<ul style="list-style-type: none"> Self-referral and referrals by health professionals from across 	<ul style="list-style-type: none"> Self and health professional referral

	Case study LAs' details of current provision and plans	
	North Yorkshire	Rotherham
	the child and young persons workforce	
Range of Tier 2 services on offer	<p>'Healthy Lifestyle'</p> <ul style="list-style-type: none"> • 12 weeks (including two 'flexi' weeks that can be tailored to an individual family) • Sessions for individual families delivered in the family home or community facilities • Graduated exit with a mixture of phone and face to face follow support up to the period of 1 year. 	<p>'Shape Up'</p> <ul style="list-style-type: none"> • Model developed at UCL and delivered in partnership by the contractor • 10 weeks of 'more-life' programme • 1-1 consultations and group sessions • Held at leisure centres across the borough • Includes free 12 week gym membership (funded by provider)

¹ Unless specified, figures are from 2015 PHE Health Profiles (www.healthprofiles.info)

² http://www.rotherham.gov.uk/jsna/info/23/people/54/ethnicity_and_cultural_identity

The following sections discuss the findings of the case studies. In particular, these centre on LWMP features as examined in the synthesis of service evaluations: Section 4.1 considers commissioners' views and experiences relating to family involvement, Section 4.2 considers practical programme content and Section 4.3 focuses on social support and the delivery of LWMPs via groups or to individual families. Section 4.4 examines some overarching issues relating to service provision and coordination, which participants from both authorities felt impacted on the delivery of successful LWMP services.

4.1 Getting the whole family on board

Both of the LAs corroborated the review findings about the critical nature of involving family members in the programmes. Participants from both authorities stressed the value of a family-based approach, for example:- *"We try to ensure that as many family*

members as possible are present at the sessions ... we do try to get everyone involved and encourage to them take on the changes.” (Provider, North Yorkshire).

The commissioner from Rotherham underscored the findings of the views synthesis in relation to the protective effect that family-based programmes can engender in relation to the negative influence of significant others:- *“Yeah that comes up a lot in sessions, you know they go to grandparents and the grandparents give them treats ... Where you’ve got siblings that are under weight, and the parents find that hard to manage, how to stop them having chocolate.”*

However, whilst the provider of the service in North Yorkshire noted that most sessions with families work well, she described some significant challenges when delivering to families within their home. In particular, she noted that interruptions and the comings and goings of family members could disrupt sessions and that it can be a challenge to pitch sessions at a suitable level for both adults and children. For example:-

“When delivering session information you need to ensure you deliver in an age appropriate way, you would talk differently to mum or dad than you would to an eight year old. And for a lot of the younger ones parents don’t want to talk about their weight in front of them, which we totally understand. So it’s making sure that you have an exercise like cut and stick for the child enabling you to chat to parents, or you would ensure to have 10 minutes separately with parents at the end to re-cap the messages you have given.”

Participants from both authorities indicated the value of having some ‘split session work’ in which children and adults have separate sessions. See table 4.1 for example evidence.

Table 4.1: Example evidence on separate and together sessions

Source	All family involvement separate and together sessions
North Yorkshire	<i>We are doing a little bit of split session work. For example when talking about portions you can do the basics with a five year old such as ‘me size meals’, but you would most likely have a separate session with mum because you need to talk about recommended amounts of certain things such as grams of fat. And for teenagers it could be that there is friction with parents over something like they are snacking a lot, a flexi session can be used to deliver an individual session with the teenager and cover it. But it is essential to still link with the parents, you'd ensure that any goals set were shared with the parents so they can provide support... But generally we try to make sure sessions are together where we can.</i>
Rotherham	<i>Families and children attend together, but they'll then do separate sessions</i>

4.2 Practical support: Physical activity sessions, practical healthy eating advice and behaviour change strategies

As illustrated in Section 2.2.3, the evidence indicates that programme content which is practical in nature is valued highly. Before sharing the findings of the review both authorities commented on the benefits of these practical approaches as illustrated in table 4.2 below.

Table 4.2: Example evidence on the need for practical support

Source	Evidence on practical sessions
North Yorkshire	<i>Feedback scoring on the sessions ranges, kids prefer the more hands on sessions like cook and eat; they are not as keen on the portion session. We are learning as we go, if we find some sessions require</i>

	<i>adapting we will change them. It is really important that delivery is right because the kids need to enjoy the sessions, be motivated and want to make changes. Delivering to individual families means we can adapt sessions to the type of family and child. So several cook and eat sessions may be delivered if this is the best way to engage the family."</i>
Rotherham	<i>We focus quite a bit on parenting, there's parenting sessions, for example, how to manage when kids go to McDonalds.</i>

Both authorities touched particularly on practical physical activity sessions. Whilst the service in North Yorkshire was unable to deliver physical activity sessions (*"delivery in the home setting limits the physical activity delivery, you can't do dodge ball in a front room, you haven't got teams"*) they provided anecdotal evidence that going beyond simply providing advice or signposting to services was beneficial:-

"So one of my team has taken two families together to a local climbing wall [...] another team member took a family to the gym for the induction session as sometimes supporting them to take that first step is what is needed. And actually that teenage boy has really taken off at the gym."

The commissioner from Rotherham acknowledged a similar effect with regards to supporting people to access community services, "By running the service in leisure centres in terms of life-long behaviour change, you're getting them through the door of a leisure centre, and into community activity."

Moreover, the provider from North Yorkshire noted that providing advice on community settings that were local may be vital to long-term behaviour change.

"I've worked group settings before, within a children's weight management programme, and I think you do have a really good time during the physical activity sessions but actually is that sustainable, if you haven't signposted them to a local club or facility. Yes they might be motivated to come back the next week but have they been motivated to continue once the group programme finishes." (Service provider, North Yorkshire)

4.3 Social support: Group versus individual sessions

As described above, we selected LAs with differing delivery approaches to enable us to understand the challenges of group delivery in rural areas and thus the relevance of the review findings across such areas. The commissioner from North Yorkshire described how the recent change from group visits to home visits was prompted by a need to enhance accessibility for families:-

“Previously we had group sessions, and this was before I was in post, but my understanding is that people just struggled to go to the group sessions. Because the area is very rural, people just couldn’t access it, or felt they couldn’t access it, so I think as a result we thought we’d try something slightly different.”

The provider from North Yorkshire added that:-

“In North Yorkshire the key issues flagged included the distance families may have to travel but also the limitations of having a set group time and location. For example if a group is held on a Wednesday 5 till 7 and a family can't make it then they miss the opportunity as the club would move on to another area in the following cycle.”

These findings with regard to group provision in rural areas are clearly intertwined with the issue of programme practicalities and convenience for families as reported in section 2.2.9. The participants from North Yorkshire LA noted that moving to an individual family approach enabled them to build in flexibility and convenience by delivering in the home and making appointments to suit individual families:- *‘we’re really flexible in that way, we can work when the family wants to work.’* The provider from North Yorkshire also considered that a family-based approach enabled flexibility in terms of delivering support and education that could be tailored to individual families.

“We’ve pulled together a 12 week programme for families, 10 weeks are set around NICE guidance - so includes the key things that you’d expect like food labelling, portion sizes, your five a day. And the other two are what we are calling

bespoke flexi sessions, and that's really about looking at the family individually and seeing if they need extra sessions, for example sleep patterns, or if it's a teenage whose having significant snacks, energy drinks that sort of thing."

However, participants from both authorities, in advance of hearing about the review findings, noted the significant benefits of group-based services as illustrated in Table 4.4 below.

Table 4.4: Example evidence on the benefits of group sessions

Source	Benefits of group sessions
North Yorkshire	<p><i>The programme is still within its early days but as I've mentioned there are challenges of delivering in the home due to other things on-going in the home such as siblings and mum preparing tea. In contrast a group setting enables two hours of dedicated time.</i></p> <p><i>We are open to idea of, when suitable, delivering some group sessions. For example if you have a cluster of families able to access a community setting you could do some joint sessions, as peer support can work well in LWMP. It is not our standard model but we are open to that if it fits for our families.</i></p>
Rotherham	<p><i>Tier 3 services moved from individual appointments to group sessions. Because we thought it was more family focused and less clinical.</i></p>

After we shared the review's findings about group-based services, the commissioner from North Yorkshire suggested that alternative group-based approaches could be considered.

"Although North Yorkshire is a predominantly rural county, the towns of Scarborough and Harrogate could be described as urban areas. So group work could be more feasible in these towns than the other sparsely populated areas

of North Yorkshire. In the more rural areas providers would need to think more creatively about how they would bring groups together.”

However, she noted that there may be some resistance in rural areas to the findings of the review, but that, *“There could still be a place for group sessions in rural areas. But it will take more time and support to get people to the groups as access will be an issue. It’s not to say it can’t be done. Using schools or local assets that we know people who live in rural areas use regularly could help.”*

The commissioner from Rotherham also suggested that working with schools held the potential for group sessions that are convenient for families.

“It’s about them getting out into the communities as well. They [contractor] are a social enterprise type model, so they are about community. So there are a couple of courses, they started in February, in a few of the schools. They’re starting to look at how that works and whether it impacts on retention. [...] So the families come after school - the kids stay after school and the families come and they do this course. [...] Also the families are used to going to the school.”

Thus the findings with regards to group delivery may not be readily adoptable in all contexts in England. However, participants from both authorities indicated that innovative approaches may help to overcome the challenges of the inconvenience of group sessions for families, in order to unlock their potential for social support.

4.4 Which other issues are key to service commissioning?

Whilst the aim of the review was to identify the critical features of LWMPs themselves, participants at each of the LAs raised issues relating to service delivery and commissioning that impact on the effectiveness and development of services. Issues

around service organisation and monitoring were felt to be key to success. There is much resonance in terms of these overarching issues with those found in the companion review on adult weight management (79). Table 4.5 provides additional illustration of each of the points that follow.

4.5.1 Service infrastructure: good working relationships, flexibility, community-based

As previously described in the companion review on adult weight management (79), the team at Rotherham valued the highly developed infrastructure and monitoring system that they had invested in.

The provider at North Yorkshire noted how the whole of children and young people services had recently been re-structured and organised so that a range of children's services including weight management, prevention, healthy child and school nurses, were 'co-located' in the same premises. The benefits of working alongside other colleagues were described as being really valuable. *"It works really well as we find other professionals will walk into the office and say "I have this family, do you think your service would be suitable for them" It facilitates a holistic offer of support for families as other key support is more likely to be offered such as local parenting programmes.."*

Participants from both authorities, however, recognised that a good service infrastructure was supported by excellent working relationships between the commissioning team and the service provision teams, as illustrated in Table 4.5. In particular, they stressed how these working relationships enabled the services to be responsive and adapt to emerging needs and challenges.

4.5.2 Referrals

Another significant impediment to meeting needs related to referrals. Whilst the National Child Weight Measurement Programme was used by both LAs to identify children, both LAs noted that other routes into the services presented challenges which

they were addressing. The commissioner from Rotherham described working with the contractor to target children at the lower end of the overweight spectrum in order to stop them progressing to the higher end. Similarly, in North Yorkshire, they had begun to roll out training to encourage referrals from healthcare professionals following some feedback that they felt uncomfortable raising the issue of weight with patients.

4.5.3 Making a business case for LAs to invest in LWMPs for children - “what is the return?”

A final significant challenge to delivery of lifestyle weight management services for children, as noted by participants from both LAs, was the difficulty of making a business case for LAs to invest in such services since the return on investment largely resulted in benefits for the NHS rather than for LAs themselves. See table 4.5 below for example comments. Participants from both LAs raised the issue of rigorous evaluation of their services, both lamenting that sufficient time and funding was not currently available. Participants from both authorities also indicated the difficulty of demonstrating the wider impacts beyond health that might result in important returns for LAs.

“In terms of decision-making ... I think what is useful now in Local Authorities is not just health outcomes, but its data on education, on attrition, that kind of thing. So if there’s anything ... that says these kids who go through a weight management course do better at school because they’re not being bullied, and the wider stuff so we have to think about employability, education you know... I guess it’s to protect our commissioning in the future because budgets are so tight. It’s not just being able to say that a larger kid is more susceptible to cancer; we’ve got to change that argument, so bringing out the other possible beneficial outcomes. So thinking about what motivates an elected member or a decision maker in a local authority, it’s not necessarily that they’ll not go to the GP as many times. ... it’s not a cost saving for next year is it? It’s a cost saving for the future. So any modelling that says like that child is more likely to go on and get a better job ... it’s a difficult one.” (Commissioner, Rotherham)

“And it's about making sure you capture all the things that you do achieve. We have assessment material for pre and post programme for example a confidence score. However, we had a young man recently, and the mum said ‘He’s got so much more confidence in himself, and he’s going out on his bike, he’s doing this ...’ and although his confidence score will go up that is not really reflective of the massive change in this child.”(Provider: North Yorkshire)

Table 4.5: Example evidence on factors at the service delivery and commissioning level

Source	North Yorkshire	Rotherham
Excellent working relationships between commissioners and providers	<i>I think that’s an advantage of it being in house as well. We have to have a relationship that separates us as commissioner and provider, but it’s not as if it is an external company, you know we can work more closely together and we can adapt more easily. If we can see there’s something emerging, and think actually we need to tackle that, it does enable us to do that I think.</i>	<i>And I think that again, because as a provider they are so driven and they want to do well, it doesn’t feel like it’s just a contract [...] I’ve never felt that from them, they’ll change how they’re running it, they’ll change the times of the sessions, they’re doing stuff in schools now because we’ve talked to them about that. They’re looking to develop all the time.</i>
Encouraging appropriate referrals	<i>One of the other things that had come out of the feedback from other providers was stakeholder engagement and professionals being willing to raise the issue of weight [...] we thought we could [...] roll out some training about raising weight [...] and the feedback was really good, people’s confidence had increased so we’re hoping that’s going to drive more referrals in.</i>	<i>But most people are not on the 85th centile, it’s higher. So what we’ve said to the provider in the last few contract meetings is how to get those kids who are on the lower end to come through, to stop them progressing.</i>
The need for	<i>It's important that we can evaluate</i>	<i>I think it needs a big evaluation,</i>

Source	North Yorkshire	Rotherham
<p>rigorous evaluation of services delivered in LAs</p>	<p><i>in a robust way. This programme is an exciting opportunity to try something new, I wanted to ensure that when the programme ends the data and information we have collected will be considered both valid and reliable...</i></p>	<p><i>we've got stacks of data, we just need a university to come in and evaluate [...] it's that kind of stuff which we don't have time to do and we can't expect services to do it.</i></p>
<p>The challenge of identifying the return on investment for LAs</p>	<p><i>And working out what our return on investment is. You know as a public manager who commissions, my job is to write the business case, take it to a meeting, and discuss why we should be investing our money in this. [...] How much money should be allocated? What is the return? How do you actually convince people?</i></p>	<p><i>It's a game, making it achievable to a provider and making it look financially attractive to a cabinet within a local authority that are looking at budget pressures and spending money.</i></p>

5. Discussion

5.1 Summary of findings

This analysis builds on the findings of previous reviews to explore the mechanisms which may explain how lifestyle weight management interventions for children work (18, 19, 29, 33). The aim was to identify programme components that are needed to maximise effectiveness and what should be avoided to minimise the risk of providing an ineffective LWMP.

Analysis of the views of children, parents and providers of LWMP services identified three key mechanisms that were perceived to support health behaviour change; having the whole family on board, social support, and being shown not just what to change but *how* to change. Our analysis of trials showed that each of these three key mechanisms were present in the most effective interventions and were not present in the least effective interventions.

Case studies with two LAs concurred with the findings on key mechanisms but they also revealed some possible challenges to implementation of these specific approaches and also of LWMPs in general.

5.2 Strengths and limitations

5.2.1 Strengths

QCA method complements existing meta-analyses by providing fine-grained detail

The strength of a meta-analysis lies in its ability to pull together multiple studies.

However, despite the number of systematic reviews already conducted, the heterogeneity and complexity of the interventions and their evaluations mean that these have been unable to identify which types, or aspects, of interventions are most likely to lead to successful outcomes (19). The QCA case study approach complements the over-arching findings from meta-analyses by making use of the inherent variance to

answer a different question to that asked by previous reviews, i.e. rather than ‘what works, on average’, this review aimed to explore the critical features of LWMPs for children to understand the mechanisms through which interventions have the impact that they do. Whilst meta-analysis rests on the need for replication of interventions, in this review the variance between interventions is a strength rather than a weakness as it enables exploration of these mechanisms; a useful feature given the lack of replication in this field. QCA allows for multiple overlapping pathways to causality, and it identifies combinations of conditions as opposed to isolating the effects of single characteristics on intervention effectiveness. This may better represent the complex causal pathways that often characterise psychosocial interventions such as LWMPs.

Employment of various analytical approaches ensure robustness of QCA findings

In addition, there are several strengths arising from the way in which we conducted the QCA that enable us to have confidence in our findings. Firstly, the QCA was underpinned by the experiential evidence that emerged from the views synthesis; it therefore ‘makes sense’ in relation to what children, parents and providers have said about their experiences of lifestyle weight management programmes. Secondly, we examined both pathways to most effectiveness, in order to identify the how to maximise effectiveness, and pathways to least effectiveness to identify LWMP approaches and components to avoid. This particular feature of the review was found to be crucial given the dearth of most effective studies as described below in section 5.2.2; the stronger evidence about pathways to least effectiveness was able to bolster our tentative conclusions about pathways to most effectiveness. Thirdly, the validity of our QCA findings about most and least effective interventions was further underscored by our comparison with the evidence from trials of moderately effective interventions. Finally, as discussed below, our findings concur with previous reviews, but offer more fine-grained evidence than is possible through a meta-analysis. Nevertheless, there were limitations of this analysis, particularly related to the studies included.

5.2.2 Limitations of the evidence-base and mitigating factors

As with any review, this analysis was limited by the evidence-base available. Notably, there was a lack of studies reporting the views of children, parents or providers involved in pre-school LWMPs and only a minority of service evaluations focused on this age group. Furthermore, the quality of the studies and their associated intervention descriptions were often poor and few interventions met the criteria for ‘most effective’. Nevertheless, the qualitative evidence focused on the same age group as most of the studies in the least effective set. A further strength of the analysis was that the evidence from the sets of most and least effective interventions *mirror* each other (i.e. where least effective interventions are characterised by the absence of certain conditions, most effective interventions are characterised by their presence). This was despite the fact that the most effective interventions included mainly pre-school and the least effective interventions included mainly primary-school aged children. As such, it seems clear that the findings would apply to both pre-school and primary-school aged children. These points are discussed in greater detail below.

Lack of qualitative evidence on pre-school children

Within the 11 qualitative studies there was a lack of views explicitly from or about pre-school aged participants. This limits their potential relevance to the most effective set of interventions, which were predominantly focused on this age group; we found no evidence from the qualitative studies to understand why interventions for this group might be more effective. Nevertheless, the focus on views about LWMPs for primary school aged children was relevant to the least effective studies, which mostly focused on this age group. And ultimately the lack of views studies relating to pre-schoolers did not prevent us from identifying components which appear to be critical to LWMP success.

Limitations of the trials: lack of high quality evaluations, poor intervention descriptions and few highly effective trials

As other reviews have also noted, the quality of the trials on this topic was not high (18, 19, 33). Another limitation was the lack of detail published regarding intervention content (19, 80), as well as only a few process evaluations. Thus some of the conditions present in our models are hypothesised proxy measures; we have made assumptions about the role of intervention conditions, for example we have assumed that by attending group sessions, participants would experience peer support. This may not always be the case; however such assumptions have been necessary, given the lack of process data associated with the included trials. However, this lack of detail was mitigated by the views synthesis enabled us to be sensitised to conditions that may have been underemphasised in published trial descriptions, which helped us to identify them in the included papers.

A greater impediment to our analyses was that only five interventions achieved clinically significant improvements in BMIz which meant they met our criterion for inclusion in the most effective set; thus we were unable to draw as robust conclusions as we would have hoped to about pathways to greater effectiveness. However, whilst the robust evidence about least effectiveness is useful in indicating approaches to avoid, it also provides further weight to the findings on pathways to most effectiveness since the two sets of evidence *mirror* each other (i.e. where least effective interventions are characterised by the absence of certain conditions, most effective interventions are characterised by their presence). We could have adjusted our criteria to allow a greater number of interventions to be included in the most effective set, but we chose to use a clinically significant cut-off for most effective, rather than an arbitrary cut-off that has no clinical meaning (81), as well as 12 month follow-up rather than a shorter period, since longer term outcomes are more important for LWMPs' overall aims (38). When coupled with the fact that the evidence on pathways to least effectiveness bolsters our confidence with regard to pathways to most effectiveness, sticking with selection of

these more meaningful inclusion criteria mean the findings are ultimately both robust *and* meaningful.

However, in addition to the overall number of most effective interventions, we found that this set of interventions was limited in range. First, as noted above, four of these five interventions focused on pre-school children exclusively. Given that overall, as found in other reviews, most trials focused on primary school aged children (29, 33, 80, 82), there is insufficient evidence to understand whether there are particular characteristics of this age group that make weight management easier to achieve. A second stark difference between the most and least effective sets of interventions was the sample size. None of the five most effective interventions had a sample size of more than 50 per arm, compared to 9 of the 15 least effective interventions. Other reviews have also found few trials with large sample sizes (19). This is of concern because small sample sizes may be associated with larger effects as a result of reporting bias, or methodological flaws (83). However, there appears to be sensible explanations for the lack of larger trials in the most effective set. For example, it may be that researchers evaluating interventions involving group sessions may have found it a challenge to recruit larger samples; of the 20 intervention arms just two arms from the same study delivered a group programme *and* had a sample size of more than 50 per arm (63). Indeed, some authors have noted the difficulties in recruiting for group-based interventions (84) and challenges in running an existing group-based programme as a trial (61). The association between group sessions and greater effectiveness may thus explain why no larger studies were found in the most effective set.

A third way in which most effective set of interventions was limited in range is that three of these interventions were developed and evaluated by the same research team (70, 71). Whilst in one way having the same or similar intervention appearing multiple times in the most effective set limits the range of findings, given that these

interventions achieved consistently clinically significant effects using the same approach but with different populations could be considered to strengthen the findings of these small studies.

Although it was clear from our findings that intensity of particular intervention components was important, there was insufficient evidence to specify exactly what the minimum intensity should be. Although for some components we say that more than two sessions are required, there was a lack of evidence confirming this; this finding was based evidence that when only two sessions were provided, this was insufficient. It may be that future research identifies a higher threshold of intensity required.

Lastly we recognise that there are likely to be other mechanisms and conditions that we have not been able to identify. On the one hand this is because of a lack of most effective trials, poor programme descriptions and a lack of process evaluations as described above, on the other this is likely because whilst it proved useful to privilege the experiences of children, parents and providers in the views synthesis, the views of other stakeholders may have revealed other important features. Indeed, the fact that some of the moderately effective interventions had the same configurations as least effective ones (i.e. none of the three models were present in five of the moderately effective interventions) indicates that this is the case. Thus it is clear that we were unable to identify some useful mechanisms that make these five interventions relatively more successful than the least effective ones. However, although more research is needed, since we have identified some clear ways in which the most effective differ from the other 25 studies the approach has been valuable.

5.3 Findings in relation to other studies

Many existing systematic reviews have been conducted on the topic of weight management in children (18-20, 25, 28, 29, 31, 33, 45, 85-91). Our findings concur with the broad findings of many of these reviews. For example, as described above four of

the five interventions that focused exclusively on pre-school children were most effective interventions. Similarly, the latest Cochrane review on interventions targeting pre-school children (19, 33) found a greater reduction in BMIz (-0.38 at 12-18 months compared to control, 95% CI -0.58 to -0.19) than the latest Cochrane review of parent-only weight management interventions (targeting 5-11 years) (-0.10 BMIz at longest follow up compared to waiting list control, 95% CI -0.19 to -0.01) (16). However, since our review has identified that getting the whole family on board is a key mechanism, the fact that the interventions examined in relation to the older age group were for parents only may also explain this difference in findings.

A systematic review conducted by NICE identified three components that should be included in interventions to maximise the likelihood of successful and sustained outcomes (29). Our findings support their broad conclusions but offer a more nuanced understanding of them. The first of their three components, targeting the whole family rather than child or parent only, reflects our first model which incorporates more detail as to the intensity of sessions, as well as the need to focus on behaviour change of the whole family – we hypothesise that delivering sessions to both child and parent would not lead to successful outcomes if the content still focused exclusively on the behaviour change of the child. Their second component, “providing dietary, physical activity and behavioural advice; particularly emphasising dietary components and behavioural support for parents” concurs in part with our model on how to change. However, our findings differ as we found that these programme components need to be practical in order to unlock both confidence and skills, that is to say that the direct provision of physical activity was found to be critical and that applied, practical dietary components and behaviour change strategies were also important. Thirdly, they identified the importance of having a high intensity intervention, in terms of contact time and programme length. Our findings refine this, by identifying for which elements of the intervention intensity appears to be important. Moreover, our review additionally identifies the critical importance of group programmes for fostering social support.

The review findings can also help providers and commissioners in several ways to interpret the PH47 NICE Guidance “Weight management: lifestyle services for overweight or obese children and young people” (NICE 2013). First, the NICE Guidance includes many recommendations relating to programme components and ways to encourage adherence. By examining the extent, pertinence and consistency of evidence from views studies this review highlights which particular programme characteristics are perceived by families and provides to be *critical* for successful outcomes. Second, the QCA findings demonstrate that these *key* programme characteristics are associated with higher effectiveness so are worth prioritising. Third, the qualitative evidence on how and why these particular features are perceived to lead to successful outcomes, reported in section 2.3, can help providers and commissioners to apply the evidence to their own contexts.

5.4 Consideration of findings

5.4.1 Being shown not just what to change but how to change

For all three aspects of LWMPs (physical activity, healthy eating and behaviour change), the views synthesis found practical approaches were most valued and the synthesis of service evaluations confirmed their importance. Views on the provision of physical activity sessions were the most widespread, consistent and emphatic in the views synthesis and whilst the views studies did not explicitly examine views according to gender, these emphatic views attributed to both boys and girls. Such sessions were found to be vital for giving children both skills and confidence in physical activity. As outlined in Chapter 2 in the context of bullying and stigma around overweight, prior to involvement in LWMPs, physical activity had not been considered an enjoyable activity. Thus it was not surprising to find that physical activity sessions were found to be a vital component of our model on how to change. However, as noted above the children in four of the five most effective interventions were pre-school children who we hypothesise would be less likely to have lost confidence around participation in physical

activity or have such a heightened awareness of prejudice or stigma. Moreover, the children in one study (70) were already engaging in at least the minimum amount of physical activity required for their age group at baseline. Thus it is unclear why directly-provided physical activity sessions emerged as such a strong finding from this particular set of studies.

With regard to practical behavioural strategies, the views synthesis makes clear that families value practical tips and ideas about how to change, as opposed to, for example, approaches which seek to explore and resolve an individual's psychological reasons for unhealthy behaviours. As individual psychological approaches are not emphasised in the views synthesis we did not explore their association with effectiveness, however, we feel it unlikely that the evidence would have shown them to be associated with effectiveness. One reason for this hypothesis is that the nature of such interventions means that they would require individual delivery rather than group delivery; thus our findings about the significance of group delivery suggests such approaches would be less likely to work. A second reason for this hypothesis draws on our understanding of the mechanisms perceived to underpin the success of interventions. As figure 2.3 in the views synthesis illustrates, many families described needing support and resilience to combat *environmental* impediments to a healthy lifestyle rather than to address *individual* psychological issues; indeed the evidence on the prevalence of overweight and obesity incidence across the globe (1) attests to the environmental, rather than individual nature of the problem.

In contrast to physical activity and practical health behaviour strategies, the findings about the need for calorie guidance was not directly supported by the views studies. Examination of this condition was guided by our understanding from an analysis of adult lifestyle weight management programmes about the need for direction from providers about energy intake and expenditure (79). The lack of evidence on this from the views synthesis, however, inhibits our understanding of exactly why this condition is so

important for successful weight management. We hypothesise that to achieve a balance between energy intake and expenditure families need to be conscious of this broader healthy-eating goal, and that where only narrower goals are pursued, such as reduction of sugary drink intake, this may not reduce overall calorie consumption.

5.4.2 Having the whole family on board

There are several ways in which having the whole family on board can be hypothesised to lead to successful weight management. Firstly, ensuring children are engaged in the intervention would likely motivate them to change their behaviours more than if the intervention only targeted parents. Secondly, as is well recognised, parents can be highly influential in terms of children's behaviours, not only through control and encouragement to support children's own food and physical activity choices but also by shaping their healthier home environment. It makes sense that if the intervention aimed to change the whole families' behaviour rather than just the child's, it is more likely that their home environment would become healthier. In addition, by focusing on the whole family, others may become more supportive of, as well as being role models for, the target child. Given the importance of environmental context in influencing behaviour, this could explain why such a focus is important.

One explanation for the higher effects seen in pre-school aged interventions is that at this age, parents have even more control over their child's behaviours. However another explanation is that younger children may yet to have formed unhealthy habits that are harder to break, thus changing behaviours to be healthier is easier.

5.4.3 Social support

Social support for children may be critical because of the near-ubiquitous context of bullying and stigma that was found in the view synthesis. It could be hypothesised that this is less of an issue for pre-school children, whose self-esteem and confidence may therefore have been less affected than older children, making it easier for them to change their health behaviours. The group sessions were often reported as enjoyable in

the views synthesis and it may be that this made the interventions more engaging for children. Changing behaviours may be more challenging for parents, since unhealthy habits may be longstanding, which could explain why support through parent group sessions was found to be important. However, as noted by the North Yorkshire provider in the case study, whilst group services clearly provide important social support, there are some benefits to individual sessions that would have to be harder to achieve in group settings, such as tailoring the programme to individual family needs.

5.5 Implications

5.5.1 The review findings suggest the following implications for commissioners and providers:-

- LWMPs should seek to develop families' skills and confidence through the use of practical programme components that show them *how* to change.
 - LWMPs should include group physical activity sessions or, where not feasible, support other means of enabling experience of physical activity.
 - LWMPs should deliver practical behaviour change strategies, such as goal-setting and parenting skills, that families can apply in their everyday lives.
 - LWMPs should provide calorie guidance such that families have a broad understanding of the need to balance energy intake with energy expenditure.
- LWMPs should seek to engage the whole family in order to ensure shared understanding and encourage a healthy home environment. LWMPs should therefore seek to:
 - change the health behaviours of the whole family;
 - ensure a sufficient number of sessions for both parents and children; and
 - ensure the programme is engaging for children.

- LWMPs should include group-based sessions, or where group sessions are not feasible seek other options to ensure participants are able experience the beneficial effects of peer support.

5.5.2 Recommendations for further primary research and synthesis that arise from this review are:

Study design, focus and methods

- More qualitative research should be conducted, exploring the view of users, parents/carers of users and providers of LWMP for children
- More research should target pre-school children
- Outcomes should be standardized, with consistent use of BMIz as a primary outcome measure to maximise comparability
- Trials should follow up participants for at least 12 months from baseline
- Trials should incorporate process evaluations that explore the implementation and experiences of the interventions being evaluated
- Future studies should be designed to minimise risk of bias and should clearly report their methods to facilitate risk of bias assessments

Intervention content

Studies should explore:

- by what mechanism provider-set energy goals may have an impact within LWMPs and what role, if any, negotiated goals should play
- how best to create peer support e.g. which group size or composition is ideal
- what intensity of different activities is most effective

6. Detailed methods

This section provides a detailed account of the methods used to conduct this review. Systematic reviews derive strength from being explicit and transparent about how they are conducted, since readers can then judge the reliability of their findings.

6.1 Design

The systematic review comprised three interconnecting pieces of research:

- 1. Views synthesis:** we examined UK research reporting children's, parents'/carers' and providers' perspectives and experiences of receiving or delivering a LWMP for children aged 0-11, to understand what they feel are critical features for successful programmes.
- 2. Synthesis of service evaluations:** we used the findings from the views synthesis to see if they were able to explain differences in outcomes between LWMPs shown in trials to be most effective for improving BMIz and those found to be least effective.
- 3. Case studies:** we conducted case studies with Local Authorities (LAs) to explore the nature of current LWMP provision for children aged 0-11 and to consider the implications of the review findings for future provision.

6.2 User involvement

We worked closely with the review commissioners to ensure that the review is relevant and accessible. Their input was sought during the review: a) to guide the scope of the research and to identify priority research areas and possible LAs for the case studies; and b) with regard to dissemination of the study findings, including input into their presentation, so that the reports meets user needs as well as possible. As part of the case studies with LAs we shared the findings of the review and sought to understand

how the findings could be used and how to present them most appropriately for those involved in commissioning services.

6.3 Review questions

This review aimed to answer the following overarching question:

What are the critical features of successful Tier 2 lifestyle weight management programmes (WMPs) for children aged 0-11?

The following questions were used to guide each of the three stages of the review:

- **Views synthesis** ‘What do children, parents/carers and providers consider to be the critical features of LWMPs for children aged 0-11 and how are they perceived to act?’
- **Synthesis** of service evaluations ‘Do the LWMP features identified as critical by these service users and providers explain differences between LWMPs shown in trials to be most effective and those shown to be least effective?’
- **Case studies** ‘How does current Local Authority provision in the UK compare and contrast with the findings about effective LWMP configurations, and what are the implications of the review findings for future provision?’

6.4 Methods for the views synthesis: Thematic analysis

6.4.1 Identifying qualitative studies for the views synthesis

Since a recent NICE review had undertaken searches for views studies (30), we focused on analysis rather than study identification. However, we employed several strategies to ensure that the set of included studies encompasses the most recent research in this area. Views studies were identified in the following ways:

- a) by locating studies identified and included in the NICE Review (30);

- b) by running an adapted version of the NICE review's searches to identify relevant studies reported since that review's searches were run (see Appendix 5 for an example search strategy used for the MEDLINE database). The searches:
- were run on the 9th and 10th December 2015, retrieving records from 2012 onwards;
 - used the following 11 databases: ASSIA (Proquest), Index to Theses (Proquest), British Education Index (EBSCO), CINAHL Plus(EBSCO), ERIC (EBSCO), Health Management Information Consortium (OVID SP), MEDLINE: Pubmed not Medline (Web of Science), MEDLINE and Medline in process (OVID SP), Psycinfo (OVID SP), Social Policy and Practice (OVID SP) and Social Sciences Citation Index (Web of Science);
 - used terms for five concepts that were combined together: 1) Treating obesity AND 2) health promotion or lifestyle interventions AND 3) population AND 4) people's views or process evaluations AND 5) UK studies.
- c) by locating studies included in other reviews of qualitative views research (14, 45, 46).

The titles and abstracts returned by the search strategy were exported into EPPI-Reviewer 4 reviewing software (92) and independently screened by pairs of reviewers (KS, RR, HB) using the predefined criteria specified in Table 5.4.2. All disagreements were resolved by discussion between the reviewers. Where it was not possible to decide on the exclusion of a paper based on the information in the title and abstract, the full report was retrieved. The same three researchers examined these full reports independently for inclusion or exclusion using modified predefined criteria (specified in parentheses in Table 5.4.2). Again, all disagreements were resolved through discussion.

6.4.2 Inclusion and exclusion criteria for the views synthesis

Table 6.4.2: Inclusion and exclusion criteria for the views synthesis

Criteria	Specification
<i>Inclusion</i>	
Population	<ul style="list-style-type: none"> • Children (≤ 11 years) who had experience of a LWMP for children; or • Parents or carers who had experience of a LWMP for children aged ≤ 11 years; or • Service providers who had delivered a LWMP for children aged ≤ 11 years.
Study type	<ul style="list-style-type: none"> • Qualitative study of views, perceptions or beliefs about LWMPs for children aged ≤ 11 years.
Country	<ul style="list-style-type: none"> • UK
Language	<ul style="list-style-type: none"> • English only
Publication date	<ul style="list-style-type: none"> • Published in or since 1990
<i>Exclusion</i>	
Document type	<ul style="list-style-type: none"> • Conference abstracts or posters • Reviews of reviews, though the reference lists were searched for primary studies
Quality and data	<ul style="list-style-type: none"> • Study with a poor description of the methods (Stage 2, full report screening only)

Criteria	Specification
	<ul style="list-style-type: none"> <li data-bbox="477 260 1333 352">• Studies with little data on experience with LWMP (Stage 2, full report screening only)

6.4.3 Quality assessment of views studies

There is a lack of consensus among qualitative researchers about how to measure quality in qualitative research (93); therefore, we were cautious about excluding papers on the basis of quality. Nonetheless, to ensure a basic level of quality, papers were excluded if they:

- a) did not provide a clear account of the methods used for data collection and analysis; or
- b) contained only minimal or ‘thin’ data pertinent to the review question.

6.4.4 Data extraction

Data were extracted from studies meeting the eligibility criteria for inclusion in the syntheses. Children’s, parents’/carers’ and providers’ views were extracted independently, leading to the development of three classification systems. As well as data on participants’ views we also extracted LWMP and methodological information from each study. This included the name and descriptive detail of the LWMP(s) being discussed (such as the programme’s target group, structure and length), the numbers and socio-demographic details of study participants, and each study’s methods of data collection and analysis.

6.4.5 Synthesis methods

After data extraction, thematic analysis (94) was used inductively to code and describe the papers. The process involved reading and re-reading the papers and applying line-by-line coding to capture descriptive themes about LWMP features (95). All of the included papers were initially coded, and these themes scrutinised by the study team

for conceptual coherence. Themes were collapsed where redundant or overlapping and split when necessary to improve their conceptual clarity. Definitions of each of the themes were written and were applied to all the studies to extract data on children's, parents'/carers' and providers' views. New descriptive themes were added where they were not covered by the existing framework, which was modified on an iterative basis. The descriptive themes were organised into higher-order analytical themes that 'went beyond' the original findings of the studies (94).

The initial stage of this process sought to identify and group descriptions of LWMP features. Reviewers looked to see whether study authors had described participants as emphasising the value of features (and if so, how this was characterised and the extent to which views were consistent), or whether participants were described as frequently mentioning any given feature. Individual illustrative quotes were also examined to see if these contained similar emphases across studies. Reviewers also noted in turn how many times a domain was mentioned across studies by children, their parents/carers, or intervention providers. This stage of analysis identified nine 'domains' that were highlighted in discussions: 1) Physical activity; 2) Healthy eating; 3) Practical health behaviour change strategies; 4) Group delivery; 5) Family involvement; 6) Ongoing support; 7) Programme breadth; 8) Provider support; 9) Programme practicalities. These domains related mainly either to the programme content (domains 1-3), or to the programme structure (domains 4-9). For each domain, studies were scrutinised for views on: a) how critical different features are perceived to be; b) whether/how these features were seen to motivate LWMP attendance, or to initiate or maintain healthy behaviours; and c) how the features might be best delivered. Where relevant and possible, themes were examined to see if they were influenced by different contextual factors, such as age, ethnicity or gender.

6.5 Methods for the synthesis of service evaluations: Qualitative comparative analysis

6.5.1 Identifying trials for the qualitative comparative analysis

As with the views synthesis, we aimed to focus resources on analysis rather than study identification since the weight management/obesity literature has been extensively reviewed. However, we employed several strategies in order to ensure that we identified all potentially includable studies. Trials were identified by screening studies identified in the following ways:

- a. by locating studies identified and included in the NICE review of lifestyle weight management services for children and young people (29);
- b. by locating studies identified and included in a Cochrane review of parent-only interventions for childhood overweight or obesity in children aged 5 to 11 (19)
- c. by running an update of the search conducted for this Cochrane review (for the period January 1, 2015 - March 7, 2016);
- d. by locating studies identified and included in a Cochrane review of interventions for overweight or obesity in pre-school children (33)
- e. by screening studies contained within data files provided by the authors of an ongoing Cochrane review on LWMP for primary school-age children (53);
- f. by screening studies included in another recent review of WMP interventions for children (18).

The titles and abstracts returned by the search strategy were exported into EPPI-Reviewer 4 reviewing software (92) and independently screened by pairs of reviewers (KS, RR, HB) using the predefined criteria specified in Table 5.5.2. All disagreements were resolved by discussion between the reviewers. Where it was not possible to decide on the exclusion of a paper based on the information in the title and abstract, the full report was retrieved. The same three researchers examined these full reports independently for inclusion or exclusion using modified predefined criteria (specified in parentheses in Table 5.4.2). Again, all disagreements were resolved through discussion.

6.5.2 Inclusion criteria: synthesis of service evaluations

Table 6.5.2: Inclusion and exclusion criteria for the synthesis of service evaluations

Criteria	Specification
<i>Inclusion</i>	
Population	<ul style="list-style-type: none"> • Children (≤ 11 years) all of whom are classified as overweight or obese.
Intervention	<ul style="list-style-type: none"> • Targeted at younger children (≤ 11 years) or their parents or carers; and • Contained multiple components (addressing diet, physical activity and strategies for behaviour change); and • Included a parental involvement component.
Comparison	<ul style="list-style-type: none"> • Control group or minimal intervention
Outcome	<ul style="list-style-type: none"> • BMIZ or BMI percentile; and • Followed-up for at least 12 months after baseline/randomisation.
Study type	<ul style="list-style-type: none"> • Randomised controlled trial
<i>Exclusion</i>	
Document type	<ul style="list-style-type: none"> • Conference abstracts or poster
Applicability	<ul style="list-style-type: none"> • Conducted outside of western Europe, North America, Australia or New Zealand (so possibly not applicable to a UK context)

6.5.3 Quality assessment: synthesis of service evaluation

Trial quality was assessed according to six risk of bias criteria as detailed in the Cochrane Handbook (96). A seventh criterion, risk of bias due to selective reporting of outcomes, was excluded since this review was only looking at one outcome measure; all studies had to report this to be included in the analysis therefore this criterion was not applicable. Risk of bias was assessed as either low, high or unclear. Assessments of trials included in existing reviews were taken when possible (18, 19, 33); where the study had not been included in these reviews, assessments were conducted by the study team.

6.5.4 Classification of studies included in QCA

We took all of the trials found through this process and ranked them in terms of the size of the mean difference in BMIz seen between the trial's intervention and control arms at 12 months. The interventions were then classified as 'most effective', 'least effective', or as 'moderately effective'. For an intervention to be classified as 'most effective' its trial needed to show a mean difference between intervention and control in the change in BMIz from baseline to 12 months that was at least -0.25 (this is the minimum reduction that has been found to be associated with improvements in health risk factors in adolescents; there remains a lack of evidence for younger children) (78). Those with a mean difference of -0.05 or less were categorised as 'least effective'.

This approach, similar to maximum variation sampling typically employed in qualitative research, and MSDO/MDSO (most similar, different outcome/most different, similar outcome) designs (97) was used to enhance our ability to detect the critical features of successful LWMPs. This same approach was used by members of this review team in a review commissioned by the Department of Health on Tier 2 weight management programmes for adults (79). By excluding interventions shown to be moderately effective, we filtered out 'noise' which might obscure differences between the most effective and least effective LWMPs.

6.5.5 Data extraction: synthesis of service evaluations

To extract information about the features of the selected LWMP interventions, we developed a coding framework based on the findings of the views synthesis, as well as other descriptive features of the intervention and evaluation, with the intention of reflecting the key features and domains of LWMPs. Data were extracted by two researchers (KS, HB) who first worked independently and then compared their work to reach a consensus.

Capturing information about intervention characteristics was not always straightforward; often there was little detail and assumptions were made. For example, where interventions were delivered by GPs, we assumed that both parent and child attended these sessions but, unless explicitly stated, we assumed that these did not attempt to engage the child specifically. Despite these challenges, we applied the coding framework to each of the interventions, capturing evidence for each of the characteristics and assigning interventions to the relevant 'conditions'.

6.5.6 Synthesis methods: Qualitative comparative analysis (QCA)

We used QCA to understand pathways to intervention effectiveness; that is to say we sought to identify whether particular combinations of LWMP features were associated with greater effectiveness or less effectiveness. We used the software, 'Kirk', to run the analysis (98).

QCA enables the identification of configurations of various intervention and other contextual features that are (or are not) present when the intervention has been successful (or not) in obtaining a desired outcome; it aims to identify the necessary and sufficient conditions for achieving a desired outcome (99). We followed the guidance offered by Thomas et al. (2014) and used the six steps they describe.

Stage 1: Building the data table. We used the findings of the views synthesis and other key intervention features to create a coding framework (See appendix 6) to capture whether particular features (or using standard QCA terminology, 'conditions') were present or not present in the most effective and least effective interventions. Before

creation of the preliminary data table, we decided to use QCA with ‘crisp sets’, which designates an intervention as either having a characteristic or not, over ‘fuzzy sets’, which allows coders to designate a study as ‘partially’ having a characteristic. Team consensus was that interventions generally either manifested characteristics or did not, and thus calibration would not be of value in our analysis. After compiling data on the presence or absence of conditions for each of the interventions in a matrix, with rows representing the interventions and columns for each of the characteristics or conditions, we examined the table for apparent differences between the most effective and the least effective interventions (see section 3.2.1). We also reviewed the data table to check for ‘deviant cases’ – i.e. circumstances where individual conditions did not appear to discriminate clearly between the most effective and least effective interventions.

Stage 2: Constructing and checking the quality of the truth tables. At this stage, the focus moved from exploring individual studies and individual conditions, as in the data table in appendix 6, to exploring particular combinations or ‘configurations’ of conditions and their association with either the most effective or the least effective interventions. Because we identified a large number of possible features for inclusion in our QCA models, we returned to our views synthesis to help in constructing more ‘specific’ truth tables (see section 2.3). The views synthesis identified salient mechanisms that were perceived to enhance the success of interventions.

Stage 3: Resolving contradictory configurations and checking for satisfactory spread. As suggested by Thomas et al. (99), we then examined the quality of the truth tables. We checked for any contradictory configurations, i.e. identical configurations that were present in both the most effective and least effective interventions. We also checked that there was a good spread of studies across the different configurations available within each model.

Stage 4: Boolean minimisation. After checking for contradictory configurations, we used Boolean minimisation to arrive at final solutions. We aimed for minimised solution sets, i.e., the most simplified configurations, that had both complete coverage and high consistency. By ‘complete coverage’, we mean that when examining causal pathways to high effectiveness, we sought minimised solutions that covered as many of the most effective studies as possible – that is, that ‘explained’ as much of the causal pathway to effectiveness as possible. By ‘high consistency’, we mean that we sought minimised solutions that did not also include interventions that were not among the most effective. Conversely, when we examined causal pathways to low effectiveness, we sought minimised solutions that covered as many of the least effective studies as possible (coverage) and that did not also include any of the most effective interventions (consistency).

Stage 5: Consideration of the ‘logical remainders’ cases. This stage of the QCA involved consideration of the potential outcome of configurations that were not present in any of the interventions.

Stage 6: Interpretation. This final stage of the QCA involved interpreting the different solutions in the light of the findings of the views synthesis. In an effort to ensure that the analysis accounted for our shared perspectives of the data, all conditions, configurations, models and interpretations were discussed by the team. We did this to ensure that construction of the QCA models and interpretation of them were based on coherent understandings of the qualitative synthesis that guided their construction.

6.6 Methods for case studies

The final stage of the review was to conduct case studies with LAs. These involved open-ended interviews in which we asked key authority staff to comment on the findings contained in this report and on the following issues:

- a) The nature of the LWMPs currently provided and how provision corresponds with the findings of this review.
- b) The process of commissioning LWMPs and the implication of the review for future decisions.
- c) How current provision is monitored and evaluated.
- d) How best to present the findings of the review in a report for wider use by LAs in the UK.

6.6.1 Selection of authorities

Authorities were selected to represent both individual and group delivery approaches, since the views and synthesis of service evaluations have identified group-based services as important, yet these are challenging to deliver in rural areas. Details of the two selected, Rotherham and North Yorkshire, can be found in Chapter 5.

6.6.2 Data collection methods

Both interviews were conducted face-to-face with members of authority staff. The first interview was conducted at the Council Offices for Rotherham Metropolitan Borough Council and involved the Head of Health Improvement for the Council. The second interview was conducted at an Early Years setting in Knaresborough and involved two members of staff from North Yorkshire County Council: the Head of Health Improvement and the LWMP services manager. All participants were asked whether they consented to the discussions being tape-recorded. Each of the two interviews lasted between one and two hours. Research ethics approval for this part of the project was obtained from UCL IOE's Research Ethics Committee.

6.6.3 Data analysis methods

A transcript was produced from each of the interview recordings. The transcripts were analysed thematically in relation to each of the case study questions. Reports of our draft findings were shared with each of the Local Authorities to check that they were happy that what was reported was representative and accurate.

7. Appendices

7.1 Appendix 1 Characteristics of studies included in the views synthesis (n=11 studies reported in 19 papers)

Study <i>Linked studies</i>	Aims	Lifestyle weight management programme(s)	Interviewees	Characteristics of interviewees	Data collection/ Analysis
Lewis et al. (2014) (37)	Experiences of overweight and obese children and young people who have successfully increased their activity levels following participation in LWMP	Name: Un-named Description: “community based program” Target group: 6 to 11-year-olds with BMI \geq 91 st centile Programme length: 48 weeks	39 children* *Also included 19 12-16 year olds	Gender: 19 boys, 20 girls Child age range: 6-11 years Ethnicity: Includes various BME populations SES: Areas with differing levels of deprivation Location: England (North) Other:	Semi-structured interviews based on a topic guide Thematic analysis

Study <i>Linked studies</i>	Aims	Lifestyle weight management programme(s)	Interviewees	Characteristics of interviewees	Data collection/ Analysis
<p>Lucas et al. (2014) (38)</p> <p>Arai (2015) (47)</p>	<p>Acceptability and implementation for providers and families taking part in MEND.</p>	<p>Name: MEND Description: “family-based, behaviour change programme” Target group: 7–13 year-olds who are overweight or obese Programme length: 10 weeks</p>	<p>31 children** 33 parents/ carers (23 families) **includes 9 siblings of attendees 29 professionals</p>	<p>Gender: 12 male attendees, 10 female attendees, mixed (parents and siblings) Child age range: 7-13 years Ethnicity: 10 families from various BME populations, 13 families white British SES: Housing tenure 16 owner, 3 social, 4 private rent Location: England (London, South West, North East) Other: Low and high attenders</p>	<p>Individual and group interviews</p> <p>Framework analysis</p>
<p>Newson et al. (2013) (39)</p>	<p>Families' experiences of a childhood obesity intervention and sought to understand factors that influence attendance and lifestyle behaviours.</p>	<p>Name: Un-named Description: “NHS childhood obesity programme” Target group: Clinically obese children (98th percentile), aged 5–15 years Programme length: 12 weeks</p>	<p>4 children 14 parents/ carers (11 families) (Children’s views not evident in data)</p>	<p>Gender: Parents mixed-sex, children not stated Child age range: 5 to 15 years Ethnicity: Not stated SES: All families lived in an area classed as high deprivation Location: England (North West) Other:</p>	<p>Semi-structured interviews</p> <p>Interpretative Phenomenological Analysis</p>

Study <i>Linked studies</i>	Aims	Lifestyle weight management programme(s)	Interviewees	Characteristics of interviewees	Data collection/ Analysis
Owen et al. (2009) (40)	Children's and parents' views and <i>experiences of attending a hospital-based childhood obesity clinic.</i>	Name: Un-named Description: Hospital-based childhood obesity clinic Target group: 5-18 years Programme length: Not reported	2 children* 21 parents/carers *9 other child participants were 12+ years but most views come from parents	Gender: 6 girls, 5 boys Child age range: 5-18* Ethnicity: Not reported SES: Not reported Location: England (South West) Other: Successful and unsuccessful service users	Short in-depth interviews Thematic analysis
Pittson (2013) (3)	To obtain parents' perceptions of the Y W8? programme and to explore further the <i>areas of the programme parents found most and least useful</i> in making healthy behaviour changes at home.	Name: Y W8? Description: family focused childhood obesity treatment programme Target group: 8-13 year olds, overweight or obese Programme length: 12 weeks	6 parents (Children provide only quantitative data)	Gender: Female Child age range: 8-13 Ethnicity: Not reported SES: Not reported Location: England (West Midlands) Other:	Semi-structured interviews Thematic analysis

Study <i>Linked studies</i>	Aims	Lifestyle weight management programme(s)	Interviewees	Characteristics of interviewees	Data collection/ Analysis
Robertson (2009) (41)	To <i>develop and pilot a community-based family programme</i> , 'Families for Health', for intervention with overweight and obese children aged 7-11 years.	Name: 'Families for Health' Description: "support for parenting, lifestyle change, as well as social & emotional development" Target group: overweight/obese children 7-13 years Programme length: 12 weeks	18 children 14 parents/carers (13 families) (Limited children's views)	Gender: 13 girls, 5 boys; parents: 12 mothers, 2 fathers Child age range: 7-13 years Ethnicity: 82% white, 18 % Asian/mixed SES: 43% routine/manual labour, 9% never worked/unemployed Location: England (Midlands) Other:	Semi-structured in-depth interviews (parents) group interviews (children) Framework analysis
Staniford (2011) (2)	Qualitative, in-depth analysis of stakeholders' (children, parents and health professionals) <i>perspectives toward the efficacy of childhood obesity treatment interventions</i>	Name: MEND Description: "community based behavioural childhood obesity treatment programme" Target group: 7–13 years with obesity Programme length: not stated	10 children 7 parents 9 providers	Gender: Mixed (parents and children) Child age range: 7-13 Ethnicity: Not reported SES: Not reported Location: Unclear (author affiliation Sheffield) Other:	Semi-structured interview Deductive framework

Study <i>Linked studies</i>	Aims	Lifestyle weight management programme(s)	Interviewees	Characteristics of interviewees	Data collection/ Analysis
Stewart thesis (2008) (42) Stewart et al. (2007) (49) Stewart et al. (2008) (50)	To provide insight into the perceptions of parents of obese children as they <i>“journey” from pre-treatment to end of treatment.</i>	Name: Un-named Description: Dietetic outpatient treatment for obesity Target group: Age 5-11, BMI >98th percentile Programme length: 6 months	17 parents	Gender: Mixed Child age range: 5-11 Ethnicity: Not reported SES: 8 out of 17 = low SES Location: Scotland Other:	In-depth interviews Framework analysis

Study <i>Linked studies</i>	Aims	Lifestyle weight management programme(s)	Interviewees	Characteristics of interviewees	Data collection/ Analysis
<p>Trigwell et al. (2011) (43)</p>	<p><i>To improve the cultural relevance of family-based childhood obesity treatment</i> in Liverpool and the UK (One section on facilitators to attending a LWMP)</p>	<p>Name: GOALS Description: A family-based community intervention for obese children, drawing on physical activity, nutrition and behaviour change. Target group: 5-13 years, overweight or obese children Programme length: 7 weeks</p>	<p>13 children 9 parents (Limited child views)</p>	<p>Gender: Five boys, eight girls; parents - female only Child age range: 5-13 years Ethnicity: Asian British (n=1), Asian Bangladeshi (n=1), Black Somali (n=5), and Yemeni (n=2). SES: All families lived within the 20% most deprived areas of the UK, with seven residing in the 10% most deprived. Location: England (North West) Other: Main languages spoken by parents included English, Arabic and Bengali. Four of the five mothers who did not identify English as one of their main languages believed they did not speak English well.</p>	<p>Semi-structured interviews Thematic analysis</p>

Study <i>Linked studies</i>	Aims	Lifestyle weight management programme(s)	Interviewees	Characteristics of interviewees	Data collection/ Analysis
Visram et al. (2013) (44)	To explore the views of key stakeholders in the <i>programme and identify possible reasons for non-completion</i>	Name: 'Balance It! Getting the Balance Right' Description: "childhood weight management programme" Target group: 4-17 years, overweight and obese Programme length: 21 months (ongoing)	20 children 20+ parents 16 providers (Limited child views)	Gender: 11 boys, 9 girls, not reported for parents Child age range: 4-16 years Ethnicity: "lacking in participants from ethnic minority backgrounds" SES: Area "characterized by high levels of deprivation" Location: England (North) Other: Includes those still attending, completed or withdrawn from programme	Semi-structured interviews Framework analysis
Watson (2012) (1) GOALS (2013) (51) Watson (2015) (52)	This thesis evaluated the feasibility of a family-based behaviour change intervention for overweight children (GOALS) and explored the <i>psychosocial process of long-term behavioural change in families with overweight children.</i>	Name: GOALS Description: "family-based behaviour change intervention for overweight children" Target group: 5-13 years, overweight or obese children Programme length: 18 weeks	39 children 34 parents	Gender: 19 boys, 20 girls; parents/carers: 29 female; 5 male Child age range: 5-13 Ethnicity: Of the 24 families for whom ethnicity was known, 22 were White-British. SES: socioeconomically deprived, urban location Location: England (North-West) Other:	Separate focus groups for children and parents Deductive and inductive thematic analysis

7.2 Appendix 2 - Characteristics of interventions included in the synthesis of service evaluations (n= 30 interventions in 24 trials)

Trial	Intervention	Number randomised to intervention/ control	Brief intervention description	Duration of intervention	Comparator	Age range / BMI eligibility	Difference in weight change between intervention & control at 12mths
Stark 2011 (71)	'LAUNCH'	8/10	24 parent and child concurrent group sessions, alternating between group clinic and home. Dietary education, PA and parenting skills	6 months	1 x 45 min paediatrician visit focusing on BMI, diet and activity recommendations	2-5 years, BMI ≥95th percentile but ≤ 100% above the mean BMI	-0.77
Weigel 2008 (77)	'Sea Lion Club'	37/36	Twice-weekly sessions for children. Modules for PA, nutrition and coping strategies. Monthly parent meetings.	1 year	2 x written therapeutic advice during doctors appointment. 3x medical supervision including lab tests.	7-15 years (mean 11.2 years), BMI >90th	-0.60

Trial	Intervention	Number randomised to intervention/ control	Brief intervention description	Duration of intervention	Comparator	Age range / BMI eligibility	Difference in weight change between intervention & control at 12mths
Stark 2014 (70)	LAUNCH-clinic (Clinic based)	14/13	Launch and clinic visits. 18 group-based sessions, focused on targeting lifestyle behaviour modification	6 months	1 x session of paediatrician counselling based on published dietary and physical activity recommendations.	2-5 years, BMI $\geq 95^{\text{th}}$ percentile but <100% above the mean BMI, parent with BMI ≥ 25	-0.56
Stark 2014 (70)	LAUNCH-HV (Home visits)	15/13	Launch and home visits, 18 sessions, group-based clinic sessions and individual home visits, focused on lifestyle behaviour modification	6 months	1 x session of paediatrician counselling based on published dietary and physical activity recommendations.	2-5 years, BMI $\geq 95^{\text{th}}$ percentile but <100% above the mean BMI, parent with BMI ≥ 25	-0.47

Trial	Intervention	Number randomised to intervention/ control	Brief intervention description	Duration of intervention	Comparator	Age range / BMI eligibility	Difference in weight change between intervention & control at 12mths
Bocca 2012 (59)	GECKO– Outpatients Clinic Study	40/35	25 sessions on dietary advice, life style PA and psychological counseling	4 months	3 sessions with paediatrician	3-5 years, BMI-z >1.1	-0.30
Resnicow 2015 (56)	BMI ² (provider+RD)	235/198	4x motivational interviewing counseling sessions by primary care providers	2 years	Routine care, plus standard educational materials for parents.	2-8 years, with a BMI ≥85th and ≤97th percentile	-0.18
Resnicow 2015 (56)	BMI ² (provider only)	212/198	4x motivational interviewing counseling sessions by primary care providers, + 6 MI-based sessions from dietitians	2 years	Routine care, plus standard educational materials for parents.	2-8 years, with a BMI ≥85th and ≤97th percentile	-0.14

Trial	Intervention	Number randomised to intervention/ control	Brief intervention description	Duration of intervention	Comparator	Age range / BMI eligibility	Difference in weight change between intervention & control at 12mths
Janicke 2008 (54)	Pediatric weight management - family based	39/26	12x90minute group sessions, separate parent and child groups (joining together at the end of each session; child session included PA and snack preparation)	16 weeks	Wait list	8-14 years; with a BMI >85 th percentile	-0.14
Janicke 2008 (54) (parent-only)	Pediatric weight management - parent only	34/26	12x90 minute parent-only group sessions	16 weeks	Wait list	8-14 years; with a BMI >85 th percentile	-0.11

Trial	Intervention	Number randomised to intervention/ control	Brief intervention description	Duration of intervention	Comparator	Age range / BMI eligibility	Difference in weight change between intervention & control at 12mths
Broccoli 2016 (60)	Pediatrician-led motivational interviewing	187/185	5 x motivational interviewing sessions	1 year	Booklet on obesity prevention	4-7 years, with a BMI percentile between ≥85th and <95th	-0.11
Backlund 2011 (58)	Family-based lifestyle intervention	58/47	14x90-120 minute group sessions for child and parent in year 1 (2 nd year internet-based)	2 years	No treatment.	8-12 years, with an age- and gender-adjusted BMI of ≥25kg/m ²	-0.11
Golley 2007 (65)	(Triple P parenting-skills training + lifestyle education)	38/36	4 x 2 hour group parenting sessions plus 7 x 20 minute telephone sessions plus 7 intensive lifestyle support group sessions, plus 7 child group PA sessions	6 months	General healthy lifestyle pamphlet and wait list.	6-9 years, overweight or obese according to IOTF but BMIz ≤3.5	-0.11

Trial	Intervention	Number randomised to intervention/ control	Brief intervention description	Duration of intervention	Comparator	Age range / BMI eligibility	Difference in weight change between intervention & control at 12mths
Taylor 2015 (74)	'MInT' (Motivational Interviewing and Treatment)	104/102	1x multidisciplinary 1-2 hour consultant session, then regular, brief contact with MInT mentor, face to face (30-40mins) or by phone (5-10mins).	2 years	2 appointments with individualized feedback at baseline and 6mths, 1 st was 30-45mins, 2 nd was 15-30 mins.	4-8 years, with BMI ≥85 th	-0.11
Kalavainen 2011 (67)	Family-centered group program	35/35	15 x 90 minute group sessions for parents, with concurrent child sessions which included PA (except one joint session), plus treatment manuals (for parents) and workbooks (for children)	6 months	Booklets for families and 2 x 30 minute individual appointments for child with school nurse, plus workbooks.	7-9 years, weight for height 120-200%	-0.10

Trial	Intervention	Number randomised to intervention/ control	Brief intervention description	Duration of intervention	Comparator	Age range / BMI eligibility	Difference in weight change between intervention & control at 12mths
Lochrie 2013 (68)	'Committed to Kids Pediatric Weight Management Program'	65/65	14 x 60-90 minute group lifestyle sessions for parent and child on nutrition, behavior modification, psychosocial interventions, exercise and medical obesity related issues.	6 months	1x 1 hour group education session led by dietitian.	8-11 years, with BMI ≥85th	-0.10
Taveras 2011 (73)	High Five for Kids	271/204	Behavioural intervention using motivational interviewing face-to-face and by telephone, educational modules, behavioural goals.	2 years	Well-child visits and follow up appointments for weight checks as standard care over 12 months	2.0 - 6.9 years, BMI ≥ 95th percentile or 85 th to 95th percentile if ≥1 parent overweight (BMI ≥25)	-0.05

Trial	Intervention	Number randomised to intervention/ control	Brief intervention description	Duration of intervention	Comparator	Age range / BMI eligibility	Difference in weight change between intervention & control at 12mths
Taveras 2015* (72)	individualised family coaching	171/184	Computerised clinical decision support system, plus educational materials, 4 newsletters, 4 telephone motivational interviewing sessions, interactive text messaging	1 year	Usual care	6-12 years; BMI \geq 90 th percentile	-0.05
Wake 2013 (76)	HopSCOTCH	62/56	1x60min appt with tertiary WM service; up to 11 GP appts using shared care software (1x20-40min appt, then 6-20min standard consultations ever 4-8 weeks)	1 year	Free to seek assistance from GP or other service.	3-10 years; BMI >95 th percentile	-0.05

Trial	Intervention	Number randomised to intervention/ control	Brief intervention description	Duration of intervention	Comparator	Age range / BMI eligibility	Difference in weight change between intervention & control at 12mths
Van Grieken 2014 (57)	Be Active, Eat Right	349/288	1-4 consultations; information provision using MI approach in well-child visit, plus up to 3 structured healthy lifestyle counselling sessions	1 year	Usual care – information provision during well child visit	5 years; overweight but not obese	-0.04
Hughes 2008 (66)	Scottish Childhood Overweight Treatment Trial (SCOTT)	69/65	7x outpatient appointments (1 st 60 minutes, subsequent 30 minutes) plus 1 x 30 minute home visit. Family-centred approach, using behaviour change strategies.	6 months	Usual care – 3-4 outpatient appointments with dietitian over 6-10 months	5-11 years, BMI ≥98 th centile	-0.04

Trial	Intervention	Number randomised to intervention/ control	Brief intervention description	Duration of intervention	Comparator	Age range / BMI eligibility	Difference in weight change between intervention & control at 12mths
Estabrooks 2009 (63)	Family Connections - interactive voice response (FC-IVR)	85/50	Workbook plus 2 x 2-hour small group behavioural sessions for parents. Ten follow-up phone calls with interactive voice recognition.	12-24 weeks	Workbook to promote increased PA and improved diet, including intervention and homework.	8-12 years; BMI >85 th percentile	-0.02
Golley 2007 (65)	Triple P - parenting-skills training with lifestyle pamphlet (P)	37/36	4 x 2 hour group parenting sessions plus 7 x 20 minute telephone sessions	6 months	General healthy lifestyle pamphlet and wait list.	6-9 years, overweight or obese according to IOTF but BMIz ≤3.5	-0.02
McCallum 2006 (55)	LEAP (Live, Eat and Play)	82/81	4 consultations (4hrs total); focused on diet and PA, plus personalised 20 page family folder.	12 weeks	No intervention	5-9 years, classified as overweight/mildly obese according to IOTF	-0.02

Trial	Intervention	Number randomised to intervention/ control	Brief intervention description	Duration of intervention	Comparator	Age range / BMI eligibility	Difference in weight change between intervention & control at 12mths
Raynor* 2012 (traditional) (69)	Paediatric obesity primary care guidelines (Traditional)	26/29	Comparator intervention, plus eight parent-only sessions, targeting decreased sugar-sweetened beverages consumption and increased PA.	6 months	3x growth assessments, with letter of results and interpretation. Monthly newsletter about healthy eating and leisure-time behaviours.	4-9 years, BMI $\geq 85^{\text{th}}$ percentile	-0.01
Coppins 2011 (62)	Family Project	35/30	2x 4 hour workshops plus 1 hour PA sessions twice weekly in term time, for child but siblings and parents also encouraged to participate.	1 year	Waiting list control	6-14 years, BMI > 91 st centile	-0.01

Trial	Intervention	Number randomised to intervention/ control	Brief intervention description	Duration of intervention	Comparator	Age range / BMI eligibility	Difference in weight change between intervention & control at 12mths
Wake 2009 (75)	LEAP 2	139/119	4 GP consultations; 16 page 'family folder'	12 weeks	No treatment	5-9 years classified as overweight/mildly obese according to IOTF but BMIz ≤ 3.0	0.02
Raynor* 2012 (substitutes) (69)	Paediatric obesity primary care guidelines (Substitutes)	26/29	Comparator intervention, plus eight parent-only sessions, targeting increased low-fat milk consumption and reduced TV watching	6 months	3x growth assessments, with letter of results along plus interpretation. Monthly newsletter with information about healthy eating and leisure-time behaviours	4-9 years, BMI $\geq 85^{\text{th}}$ percentile	0.03

Trial	Intervention	Number randomised to intervention/ control	Brief intervention description	Duration of intervention	Comparator	Age range / BMI eligibility	Difference in weight change between intervention & control at 12mths
Estabrooks 2009 (63)	Family Connections - interactive group (FC-Group)	85/50	Workbook plus 2 x 2-hour small group behavioural sessions for parents.	12-24 weeks	Given workbook to promote increased PA and improved diet, including intervention and homework.	8-12 years; BMI >85 th percentile	0.04
Bryant 2011 (61)	WATCH-IT	35/35	Weekly individual appointments focused on a Healthy Eating Lifestyle Programme and group PA sessions. Optional extension by 4 or 8 months.	4 months	12 month wait list	8-16 years; BMI >98 th percentile	0.06
Gerards 2015 (64)	GO4fit (Lifestyle Triple P)	44/42	10 x 90 minute parental group sessions plus 4x15-30 minute telephone sessions	14 weeks	2 brochures and a short online knowledge quiz	4-8 years, overweight or obese	0.13

*Study reports additional trial arms that were not included in the analysis

7.3 Appendix 3 - Quality assessment of included trials: Risk of bias

Trial	Intervention	Quality assessment in previous review used?	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Other
Most effective interventions								
Stark (2011)	LAUNCH	Cochrane pre-school	Low	Low	High	Low	Low	Low
Weigel (2008)	“Sea Lion Club”	Peirson 2015	High	High	High	Unclear	Low	Low
Stark (2014)	LAUNCH-clinic (Clinic based)	Cochrane pre-school	Low	Low	High	Low	High	Unclear
Stark (2014)	LAUNCH-HV (Home visits)	Cochrane pre-school	Low	Low	High	Low	High	Unclear
Bocca (2012)	GECKO-Outpatients Clinic Study	Cochrane pre-school	Low	Unclear	Unclear	Low	Low	Low

Trial	Intervention	Quality assessment in previous review used?	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Other
Mid-effect interventions								
Resnicow (2015)	BMI ² (provider+RD)	Cochrane parent-only	Unclear	Unclear	High	Low	Low	Low
Resnicow (2015)	BMI ² (provider only)	Cochrane parent-only	Unclear	Unclear	High	Low	Low	Low
Janicke (2008)	Pediatric weight management - family based	Cochrane parent-only Peirson 2015 Morgan 2013	Unclear	Unclear	High	Unclear	High	Unclear
Janicke (2008)	Pediatric weight management - parent only	Cochrane parent-only Peirson 2015 Morgan 2013	Unclear	Unclear	High	Unclear	High	Unclear
Broccoli (2016)	Pediatrician-led motivational interviewing	None available	Low	Low	High	High	Unclear	Low

Trial	Intervention	Quality assessment in previous review used?	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Other
Backlund (2011)	Family-based lifestyle intervention	Peirson 2015	Unclear	Unclear	High	Unclear	Low	Low
Golley (2007)	(Triple P parenting-skills training + lifestyle education)	Cochrane parent-only Morgan 2013 Peirson 2015	Low	Low	Unclear	Low	Unclear	Unclear
Taylor (2015)	'MIInT' (Motivational Interviewing and Treatment)	None available	Unclear	Unclear	High	Low	Unclear	High
Kalavainen (2011)	Family-centered group program	Morgan 2013	Unclear	Unclear	Unclear	High	Unclear	High
Lochrie (2013)	'Committed to Kids Pediatric Weight Management Program'	Peirson 2015	Unclear	Unclear	High	Unclear	High	High

Trial	Intervention	Quality assessment in previous review used?	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Other
Least effective interventions								
Taveras (2011)	'High Five for Kids'	Cochrane pre-school Peirson 2015	Low	Unclear	Unclear	Low	Unclear	Low
Taveras (2015)	Study of Technology to Accelerate Research (STAR)	None available	Low	Low	High	Low	Unclear	Low
Wake (2013)	'HopSCOTCH'	Peirson 2015	Low	Unclear	High	Low	Low	High
van Grieken (2014)	'Be Active, Eat Right'	Cochrane parent-only	Low	Unclear	Low	Low	Unclear	Unclear
Hughes (2008)	Scottish Childhood Overweight Treatment Trial (SCOTT)	Morgan 2013	Low	Low	High	Low	Unclear	Low

Trial	Intervention	Quality assessment in previous review used?	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Other
Estabrooks (2009)	Family Connections - interactive voice response (FC-IVR)	Cochrane parent-only Morgan 2013	Low	Unclear	High	Low	High	Unclear
Golley (2011)	Triple P - parenting- skills training with lifestyle pamphlet (P)	Cochrane parent-only Morgan 2013 Peirson 2015	Low	Low	Unclear	Low	Unclear	Unclear
McCallum (2006)	LEAP (Live, Eat and Play)	Morgan 2013 Peirson 2015	Low	Unclear	High	Unclear	Low	Low
Raynor (2012)	paediatric obesity primary care guidelines (Traditional)	Cochrane parent-only	Low	Low	Unclear	Low	Low	Unclear
Wake (2009)	'LEAP2'	Morgan 2013 Peirson 2015	Low	Low	High	Low	Low	Unclear

Trial	Intervention	Quality assessment in previous review used?	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Other
Raynor (2012)	paediatric obesity primary care guidelines (Substitutes)	Cochrane parent-only	Low	Low	Unclear	Low	Low	Unclear
Estabrooks (2009)	Family Connections - interactive group (FC-Group)	Cochrane parent-only Morgan 2013	Low	Unclear	High	Low	High	Unclear
Coppins (2011)	'Family Project'	Morgan 2013 Peirson 2015	Unclear	Unclear	High	Unclear	Low	Low
Bryant (2011)	WATCH IT	Morgan 2013 Peirson 2015	Low	Unclear	High	Unclear	High	High
Gerards (2015)	GO4fit (Lifestyle Triple P)	None available	Low	Low	High	Low	Low	Unclear

7.4 Appendix 4 - Example search strategy for identification of studies for the views synthesis

Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid

MEDLINE(R) <1946 to Present>

Search Strategy:

-
- 1 pediatric obesity/ (1879)
 - 2 Weight reduction programs/ (940)
 - 3 ((reduc* or decreas* or treat* or manag* or control* or improv*) adj6 (obes* or "weight gain" or "weight loss" or overweight or "over weight")).ti,ab. (68607)
 - 4 (weight adj1 (manag* or reduc* or control*)).ti,ab. (19686)
 - 5 ((obes* or overweight or "over weight") adj3 (child* or infant? or boy? or girl?)).ti,ab. (19221)
 - 6 (exp obesity/ or overweight/) and (reduc* or decrease* or treat* or manag* or control* or improv*).ti,ab. (88438)
 - 7 exp obesity/dh, pc, px, th or overweight/dh, pc, px, th (40945)
 - 8 pediatric obesity/dh, pc, px, th (981)
 - 9 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 (150461)
 - 10 exp behavior therapy/ or family therapy/ or *family practice/ or weight loss/ (129840)
 - 11 exp Exercise Therapy/ (34442)
 - 12 ((group* or family or families* or cognitive) adj1 therap*).ti,ab. (17313)
 - 13 "outpatient care".ti,ab. (3572)
 - 14 ((lifestyle or life style or behavio?r or behavio?ral) adj2 (intervention* or project* or strateg* or program* or organi?ation* or model* or scheme* or initiative* or service*)).ti,ab. (29964)

- 15 ("health promotion" adj2 (intervention* or project* or program* or scheme* or initiative* or service*)).ti,ab. (4956)
- 16 ((dietary or diet or physical activit* or exercise or nutrition or nutritional) adj1 (intervention* or program* or project or projects or strateg* or organi?ation* or model* or scheme* or initiative* or service*)).ti,ab. (29345)
- 17 ((dietary or diet or physical activit* or exercise or nutrition or nutritional) adj1 (education or training)).ti,ab. (17218)
- 18 (obes* adj2 treatment*).ti,ab. (8014)
- 19 (children adj3 parent* adj3 (therap* or treatment* or intervention* or program* or project or projects or strateg* or organi?ation* or model* or scheme* or initiative*)).ti,ab. (1240)
- 20 ((school-based or school or schools or communit*) adj2 (program* or project* or intervention* or organi?ation* or model* or scheme* or initiative* or service*)).ti,ab. (35749)
- 21 ("use" or wear*) adj2 pedometer*).ti,ab. (166)
- 22 ((famil* or parent* or family based or caregiver*) adj1 (treatment* or intervention* or program* or project*1 or organi?ation* or model* or scheme* or initiative* or service*)).ti,ab. (7942)
- 23 ((parent or caregiver*) adj2 (behavio?r or involve* or control* or attitude* or educat*)).ti,ab. (4510)
- 24 ((behavio?r or behavio?ral) adj1 (therapy or modification)).ti,ab. (16733)
- 25 (LEAP RCT or SCOTT or SHINE or (leap adj3 trial)).ti,ab. (4301)
- 26 (weight adj1 (manag* or loss or control or reduc*) adj2 (intervention* or program* or project or organi?ation* or model* or scheme* or initiative* or service* or dietary or diet or physical activit* or exercise or nutrition or nutritional or group? or class or classes or club? or camp?)).ti,ab. (9445)

- 27 ((("healthy weight" or obesity) adj2 (intervention* or program* or project or organi?ation* or model* or scheme* or initiative* or service* or group or groups or class or classes or club or clubs or camp or camps)).ti,ab. (6088)
- 28 (Life style/ or health promotion/) and (intervention* or program* or project or projects or scheme* or initiative* or service*).ti,ab. (38634)
- 29 life style/ and exp diet therapy/ (1782)
- 30 Weight Reduction Programs/ (940)
- 31 life style/ and risk reduction behavior/ (997)
- 32 ((mend or "watch it") adj1 program*).ti,ab. (8)
- 33 ("on the go" or kick-start or "more life" or "balance it" or "co action" or "be active eat well" or "project story" or SHINE or weight concern or help trial or "healthy eating and lifestyle program" or COCO or COBWEBS or HENRY).ti,ab. (9028)
- 34 ((carnegie or day or residential or boot or weight loss or obes* or overweight) adj (camp or camps or club or clubs)).ti,ab. (362)
- 35 (jenny adj craig*).ti,ab. (7)
- 36 (rosemary adj conley*).ti,ab. (8)
- 37 (weightwatchers or "weight watchers" or "Slimming World").ti,ab. (103)
- 38 (cambridge adj (weight plan* or weight program* or diet*1)).ti,ab. (27)
- 39 ("lighter life" or lighterlife).ti,ab. (6)
- 40 (counterweight and (exercise or nutrition or weight or obese or obesity or program*).ti,ab. (33)
- 41 ("commercial weight" adj (manag* or loss or control or reduc*).ti,ab. (140)
- 42 (slimming adj3 (club* or group* or organi?ation* or program* or scheme* or initiative* or intervention* or service* or project*1 or class*).ti,ab. (53)

43 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 (337564)

44 (henry adj3 (exercise or nutrition or weight or obese or obesity)).ti,ab. (22)

45 (carnegie adj3 weight management).ti,ab. (0)

46 morelife.ti,ab. (0)

47 ("child health improvement sessions" or "family initiative supporting childrens health" or "fit friendz" or "food fit fun" or "getting our active lifestyles started" or "live eat and play" or "mind exercise nutrition do it" or "carnegie weight management" or "alive n kicking" or "beezee bodies" or "care of childhood obesity" or "connect 3" or "fisch family support" or "fit for life academy" or "fun 4 life" or "go 4 it" or "getting our active lifestyles started" or "self help independence nutrition and exercise" or "traffic light childhood obesity" or "Y W8" or "young PALS" or "practice activity and leisure scheme" or "Sheffield obesity trial" or "Scottish childhood overweight treatment trial" or "America on the move" or "stanford sports to prevent obesity" or "mini mend" or "mend 5-7" or "combating obesity ltd" or "Health exercise nutrition for the really young").ti,ab. (58)

48 44 or 45 or 46 or 47 (76)

49 exp child/ or child, preschool/ or infant/ (1846228)

50 (child* or schoolchild* or school pupil* or "preadolescen*" or "pre adolescen*" or infant* or kids or youngster* or boy? or girl? or boy?s? or girl?s? or kindergarten or prepubescent or "primary school" or "early years" or preschool*).ti,ab. (1440119)

51 pediatrics/ or pediatric*.ti,ab. or paediatric*.ti,ab. (260932)

52 pediatric obesity/ (1879)

53 49 or 50 or 51 or 52 (2400563)

54 (ethnolog* or stories or "content analys*" or "ethnographic*" or "observational method*" or "participant observation*" or "field notes" or Experience? or narrative? or discourse? or

"repertory grid" or "process evaluation*" or "in-depth" or "service need?" or descriptive or "feelings" or ethnopsychology or "focus groups" or "behavioral research" or "behavioural research" or "narration" or "satisfaction" or "dissatisfaction" or "meanings" or "meaning" or "perspectives" or "perspective" or "perceived" or "perceives" or "perceive" or "perceptions" or "perception" or "views" or "view" or "qualitative" or "interviewed" or "interviewing" or "interviewer" or "interviews" or "interview" or "comprehension" or "case studies" or "case study" or "opinions" or "opinion" or "expectations" or "expectation" or "thoughts" or "narratives" or "standpoint" or "standpoints" or "viewpoints" or "viewpoint" or "audio record*" or lifeworld* or audiorecord* or "thematic analysis" or "phenomenol*" or "grounded theory" or "grounded studies" or "grounded research" or "purposive sampling" or "constant comparative" or "constant comparison" or "purposive sample" or "field study" or "field studies" or "field research" or "biographical method" or "theoretical sampl*" or "open-ended" or "open ended" or "life world*" or "life-world*" or "conversation analysis" or "conversation analyses" or "theoretical saturation" or "thematic analys*").ti,ab. (2060368)

55 "Purposive Sample"/ or "Ethnology"/ or "Ethnological Research"/ or "Grounded Theory"/ or "Needs Assessment"/ or "Phenomenological Research"/ or exp "Survey Research"/ or "Field Studies"/ or "Descriptive Research"/ or "Behavioral Research"/ or "Focus Groups"/ or "Interviews+"/ or "Narratives"/ or "Surveys"/ or "Videorecording"/ or "Discourse Analysis"/ or "Thematic Analysis"/ or "Semantic Analysis"/ or "Constant Comparative Method"/ or "Content Analysis"/ or "Audiorecording"/ or "Participant Observation"/ or exp "Observational Methods"/ or exp "Qualitative Studies"/ (145300)

56 (((process or longitud* or service) adj2 evaluat*) or ((program* or intervention*) adj3 (delivery or implement* or feasibil* or mediator? or moderator? or mechanism? or factor? or implementation or characteristics)) or acceptab* or satisfact* or dissatisfact* or engagement or participation or "mixed method*" or (barrier? adj3 facilitator?)).ti,ab. (503280)

57 54 or 55 or 56 (2444122)

58 United Kingdom/ or London/ or Great Britain/ or England/ or exp channel islands/ or northern ireland/ or scotland/ or hebrides/ or wales/ (329492)

59 (England not "New England").ti,ab,in. (81182)

60 ("English child*" or "English population?" or "English longitudinal" or "English town?" or "English count*" or "English city" or "English cities" or "English health").ti,ab. (1182)

61 ("United Kingdom" or "U.K." or (UK not "Informa UK Ltd")).ti,ab,in,jw. (1012134)

62 (Britain or GB).ti,ab,in,jw. (26736)

63 (British not ("British Columbia" or "British Psychological Association")).ti,ab. or (British not "British Columbia").in,jw. (488967)

64 (London not ("new london" or "Ontario" or "springer-Verlag London")).ti,ab,in. (327063)

65 (York not "new york").ti,ab,in. (19524)

66 (Birmingham not Alabama).ti,ab,in. (42308)

67 ("NHS Trust?" or "NHS Health board?" or "NHS Commission*" or "NHS Service?" or "primary care trust?" or "Social Care Trust?").ti,ab. (3610)

68 (Scotland or Scottish or Welsh or "Northern Ireland" or "Northern Irish" or (Wales not "New South Wales") or "channel isles" or "channel island?").ti,ab,in,jw. (112879)

69 (aberdeen or aberdeenshire or abertawe or aintree or airedale or "st albans" or aldershot or aneurin or anglesey or angus or antrim or argyll or armagh or ashfield or ashford or ayr or ayrshire or barking or barnet or barnsley or barry or barts or basildon or bassetlaw or bedford or bedfordshire or belfast or berkshire or betsi or bevan or bexley or birkenhead or blackburn or blackpool or bolton or bournemouth or bradford or brent or bridgend or brighton or bristol or bromley or brompton or bromwich or buckinghamshire or burnley or burton or bute or cadwaladr or caerphilly or calderdale or camberwell or cambridge or cambridgeshire or camden or canterbury or cardiff or carlisle or carmarthenshire or ceredigion or chelsea or cheshire or chester or chesterfield or chichester or clackmannanshire or cleveland or clyde or colchester or coleraine or comhairle or conwy or cornwall or "county down" or coventry or

crawley or croydon or cumbernauld or cumbria or cwmbbran or dagenham or darlington or
dartford or denbighshire or derby or derbyshire or devon or doncaster or dorset or dudley or
dumfries or dunbartonshire or dundee or dunfermline or dunstable or durham or dysart or
ealing or eastbourne or edinburgh or ely or enfield or epsom or essex or exeter or falkirk or
farnborough or fermanagh or fife or flintshire or forth or frimley or fulham or furness or
galloway or gateshead or glamorgan or glasgow or gloucester or gloucestershire or goole or
grampian or gravesham or greenwich or grimsby or guildford or gwent or gwynedd or hackney
or halton or "tower hamlets" or hammersmith or hampshire or harefield or haringey or
harrogate or harrow or hartlepool or harwell or hastings or havering or helens or helier or
hereford or hertfordshire or highland or hillingdon or hinchingsbrooke or holland or homerton or
hounslow or hove or huddersfield or hull or humber or hywel or inverclyde or inverness or
ipswich or islington or kensington or kent or kettering or "Milton Keynes" or kilbride or
kilmarnock or kingston or kinross or kirklees or knowsley or lambeth or lanarkshire or
lancashire or lancaster or leeds or leicester or leicestershire or lewisham or lichfield or lincoln
or lincolnshire or lisburn or liverpool or livingston or llanelli or londonderry or lothian or
loughborough or luton or "king's lynn" or maidstone or manchester or mansfield or medway or
merseyside or "merthyr tydfil" or merton or middlesbrough or middlesex or midlands or
midlothian or monmouthshire or moray or morecambe or morgannwg or neath or newcastle or
newham or newport or norfolk or northampton or northamptonshire or northumberland or
northumbria or norwich or nottingham or nottinghamshire or oadby or oldham or omagh or
orkney or ormskirk or oxford or oxfordshire or paisley or papworth or pembrokehire or
pennine or perth or peterborough or plymouth or ponypridd or poole or portsmouth or powys
or preston or redbridge or redcar or renfrewshire or rhondda or richmond or ripon or rochdale
or rotherham or rushmoor or salford or salisbury or sandwell or scarborough or scilly or
sheffield or "sherwood forest" or shetland or shrewsbury or shropshire or sidcup or slough or
solihull or somerset or southampton or southend or southport or southwark or staffordshire or

stamford or stirling or stockport or stockton or stoke or suffolk or sunderland or surrey or
sussex or sutton or swansea or swindon or "cwm taf" or talbot or tameside or taunton or
tayside or tees or teesside or telford or thurrock or torfaen or truro or tunbridge or tyneside or
tyrone or ulster or wakefield or walsall or waltham or wandsworth or warrington or
warwickshire or watford or westminster or wigan or "isle of wight" or wigston or "fort William"
or wiltshire or winchester or wirral or woking or worcester or worcestershire or worthing or
wrexham or wrightington or "wye valley" or yeovil or yorkshire or Wolverhampton).ti,ab,in. or
(bath or wells or reading).in. (1352794)

70 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 or 66 or 67 or 68 or 69 (2317448)

71 48 and 57 (23)

72 9 and 43 and 53 and 57 (2755)

73 72 and 70 (350)

74 71 or 73 (362)

75 animal/ not (animal/ not human/) (1599840)

76 74 not 75 (358)

77 (letter or editorial or "historical article").pt. (1678476)

78 76 not 77 (356)

79 limit 78 to ed=20120511-20151205 (162)

7.5 Appendix 5 - Example search strategy for the trials search update

#	Searches	Results	Search Type
1	obesity/	297816	Advanced
2	morbid obesity/	14500	Advanced
3	abdominal obesity/	7636	Advanced
4	childhood obesity/	6080	Advanced
5	weight reduction/	121749	Advanced
6	weight control/	4595	Advanced
7	(adipos* or obes*).tw.	351495	Advanced
8	(overweight* or over weight*).tw.	66387	Advanced
9	(weight adj1 (reduc* or los* or control* or manage*)).tw.	114538	Advanced
10	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9	546038	Advanced
11	behavior therapy/	38708	Advanced
12	cognitive therapy/	39857	Advanced
13	exp counselling/	120423	Advanced
14	family therapy/	11177	Advanced
15	social support/	65428	Advanced
16	exp program evaluation/	8245	Advanced
17	exp exercise/	241526	Advanced
18	exp physical education/	10641	Advanced
19	exp physical activity/	277562	Advanced
20	exp motor activity/	410094	Advanced
21	training/	67116	Advanced
22	exp diet/	232506	Advanced
23	exp diet therapy/	275555	Advanced
24	nutritional health/	5145	Advanced
25	child nutrition/	13242	Advanced
26	feeding behavior/	60883	Advanced
27	patient education/	93529	Advanced
28	health promotion/	76700	Advanced
29	health literacy/	4364	Advanced
30	nutrition education/	3028	Advanced
31	health education/	81598	Advanced
32	school health education/	561	Advanced
33	school health service/	13967	Advanced

34	lifestyle/	83829	Advanced
35	lifestyle modification/	24434	Advanced
36	((obesity adj3 intervention) or program or programme or camp?).tw.	592210	Advanced
37	(lifestyle or life style).tw.	90581	Advanced
38	exercis*.tw.	279301	Advanced
39	(physic* adj (activ* or fit*)).tw.	102442	Advanced
40	(walk* or jog* or swim* or weight lift* or danc* or aerobics).tw.	149662	Advanced
41	((physic* or strength* or resist* or circuit or weight or aerob* or cross or endurance or structur*) adj3 train*).tw.	45969	Advanced
42	(behavio?ral or behavio?r modification or psychoth* or psychosocial).tw.	432573	Advanced
43	((group or family or cognit* or behav*) adj therap*).tw.	32866	Advanced
44	counsel?ing.tw.	89043	Advanced
45	educat*.tw.	529833	Advanced
46	((parent? or family) adj (based or focused or directed or centered or only or led)).tw.	10988	Advanced
47	(diet* or healthy nutrition or (nutrition* adj (knowledge or educat* or therap* or program* or intervention*))).tw.	524112	Advanced
48	or/11-47	3294021	Advanced
49	10 and 48	213738	Advanced
50	obesity/ or morbid obesity/	308844	Advanced
51	(prevention or rehabilitation or therapy).fs.	2417926	Advanced
52	50 and 51	47756	Advanced
53	49 or 52	228990	Advanced
54	juvenile/	25277	Advanced
55	child/	1372926	Advanced
56	infant/	550272	Advanced
57	baby/	13016	Advanced
58	toddler/	2192	Advanced
59	preschool child/	504660	Advanced
60	school child/	270804	Advanced
61	pediatrics/	61319	Advanced
62	minors.tw.	3254	Advanced
63	(boy or boys or boyhood).tw.	142801	Advanced
64	girl*.tw.	146207	Advanced
65	infant*.tw.	369165	Advanced

66	(baby or babies).tw.	71603	Advanced
67	toddler?.tw.	8754	Advanced
68	(kid or kids).tw.	7011	Advanced
69	(child or childs or children* or childhood* or childcare* or schoolchild*).tw.	1295692	Advanced
70	p?ediatric*.tw.	365963	Advanced
71	or/54-70	2563898	Advanced
72	53 and 71	39664	Advanced
73	childhood obesity/	6080	Advanced
74	(pc or rh or th).fs.	2417926	Advanced
75	73 and 74	956	Advanced
76	72 or 75	39829	Advanced
77	limit 76 to (english language and yr="2015 -Current")	3310	Advanced
78	limit 77 to (human and english language and yr="2015 -Current")	3228	Advanced

7.6 Appendix 6: Data tables from synthesis of service evaluations

7.6.1 Data table of individual conditions in interventions included in most and least effective interventions*

Intervention features	Stark 2011	Weigel	Stark 2014 clinic	Stark 2014 home visits	Bocca	Taveras 2011	Taveras 2015	Wake 2013	Van Grieken	Hughes	Estabrooks IVR	Golley parent-only	McCallum	Raynor traditional	Coppins	Wake 2009	Raynor substitute	Estabrooks group	Bryant	Gerards	Total most effective (n=5)	Total least effective (n=15)	
	Most effective interventions					Least effective interventions																	
Advice on calorie intake	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
Delivered by psychologist	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	5	1
Group physical activity sessions for children	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	5	2
Group sessions (any type) for children	1	1	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	5	2
More than 2 group discussion/education sessions for parents	1	1	1	1	1	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	1	5	4
Intervention designed to engage children	1	1	1	1	1	0	1	0	0	1	0	0	0	0	1	0	0	0	0	1	0	5	4

Intervention features	Stark 2011	Weigel	Stark 2014 clinic	Stark 2014 home visits	Bocca	Taveras 2011	Taveras 2015	Wake 2013	Van Grieken	Hughes	Estabrooks IVR	Golley parent-only	McCallum	Raynor traditional	Coppins	Wake 2009	Raynor substitute	Estabrooks group	Bryant	Gerards	Total most effective (n=5)	Total least effective (n=15)
More than 2 sessions on practical health behaviour change strategies	1	1	1	1	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	1	5	4
High intensity (6+ months, 10+ sessions delivered at least fortnightly)	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	4	1
Group discussion/education sessions for children (i.e. not physical activity)	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	4	1
Exclusively focused on pre-school children (5yrs and under)	1	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	4	1
Delivered food tasting sessions	1	0	1	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	3	1
Providers given intervention-specific training	0	0	0	0	0	1	0	1	1	1	0	1	1	0	0	1	0	0	1	1	0	9
50+ participants per arm	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	1	0	1	0	0	0	9
Behavioural goals set in negotiation with parents	0	0	0	0	0	1	1	0	1	1	1	0	1	0	0	0	0	1	0	1	0	8

Intervention features	Stark 2011	Weigel	Stark 2014 clinic	Stark 2014 home visits	Bocca	Taveras 2011	Taveras 2015	Wake 2013	Van Grieken	Hughes	Estabrooks IVR	Golley parent-only	McCallum	Raynor traditional	Coppins	Wake 2009	Raynor substitute	Estabrooks group	Bryant	Gerards	Total most effective (n=5)	Total least effective (n=15)
Child does not attend (only parent)	0	0	0	0	0	0	1	0	0	0	1	1	0	1	0	0	1	1	0	1	0	7
Narrow dietary advice	0	0	0	0	0	1	1	0	1	0	0	0	0	1	0	1	1	0	0	0	0	6
Intervention included monitoring	1	1	1	1	1	1	0	0	1	1	1	0	0	1	0	0	1	0	0	0	5	6
Provider review of goals	1	1	1	1	1	0	1	1	0	1	1	0	0	1	0	1	1	0	0	0	5	7
Parenting skills training provided	1	0	1	1	1	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	4	4
Delivered individual sessions (for parent or parent and child)	1	0	0	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	1	1	3	11
Included a graduated exit from the intervention	1	0	1	1	0	0	1	0	1	1	1	1	0	1	0	0	1	0	0	0	3	7
Excluded children with a higher BMIz at baseline (i.e. had a maximum cut off as well as a minimum for inclusion)	1	0	1	1	0	0	0	0	1	0	0	1	1	0	0	1	0	0	0	0	3	4
Offered support after the intervention had ended	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	3

Intervention features	Stark 2011	Weigel	Stark 2014 clinic	Stark 2014 home visits	Bocca	Taveras 2011	Taveras 2015	Wake 2013	Van Grieken	Hughes	Estabrooks IVR	Golley parent-only	McCallum	Raynor traditional	Coppins	Wake 2009	Raynor substitute	Estabrooks group	Bryant	Gerards	Total most effective (n=5)	Total least effective (n=15)
Intervention did not focus on weight management (e.g. focused on broader wellbeing)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Intervention covered the issue of bullying	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1

* Not all data extracted is represented here; for full details please contact the authors.

7.6.2 Data Table from QCA Analysis

Domain/ mechanism	Intervention features	Stark 2011	Weigel	Stark 2014 clinic	Stark 2014 home visits	Bocca	Taveras 2011	Taveras 2015	Wake 2013	Van Grieken	Hughes	Estabrooks IVR	Golley parent-only	McCallum	Raynor traditional	Wake 2009	Raynor substitute	Estabrooks group	Bryant	Gerards	Coppins	Total most effective (n=5)	Total least effective (n=15)	
		Most effective interventions					Least effective interventions																	
1. How to change	Child physical activity sessions	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	5	2
	>2 practical behaviour change strategies	1	1	1	1	1	0	0	0	0	1	0	0	0	1	0	1	0	0	1	0	5	4	
	Calorie intake advice	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	
2. All family on board	Child-friendly sessions	1	1	1	1	1	0	1	0	0	1	0	0	0	0	0	0	0	1	0	1	5	4	
	Aim to change behaviour of whole family	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	0	0	1	5	11	
	>2 education/ discussion sessions for children and parents	1	1	1	1	1	1	0	1	1	1	0	0	1	0	1	0	0	1	0	0	5	7	
3. Social support	Child group sessions	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	5	2	
	>2 parent group sessions	1	1	1	1	1	0	0	0	0	0	0	1	0	1	0	1	0	0	1	0	5	4	

7.6.3 Data table of QCA conditions for mid-effect interventions

Domain/ mechanism	Intervention features	Resnicow (provider+RD)	Resnicow (provider only)	Janicke (family-based)	Janicke (parent-only)	Broccoli	Backlund	Golley (Triple P + lifestyle education)	Taylor	Kalavainen	Lochrie
1. How to change	Child physical activity sessions	0	0	1	0	0	1	1	0	1	0
	>2 practical behaviour change strategy sessions	0	0	1	1	0	1	1	1	1	1
	Calorie intake advice	0	0	0	0	0	0	0	0	0	0
2. All family on board	Child-friendly sessions	0	0	1	0	0	1	1	0	1	1
	Aim to change behaviour of whole family	0	0	1	1	0	1	1	1	1	1
	>2 education/ discussion sessions for children and parents	0	0	1	0	1	1	1	0	1	1
3. Social support	Child group sessions	0	0	1	0	0	1	1	0	1	0*
	>2 parent group sessions	0	0	1	1	0	1	1	0	1	0*

*group sessions were run, but these included both parent and child, which may have inhibited peer support

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